

UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF NORTH CAROLINA
ASHEVILLE DIVISION

STATE OF NORTH CAROLINA)
ex rel. Roy Cooper, Attorney)
General,)
Plaintiff,) No. 1:06-CV-20
)
vs.) **VOLUME 11**
)
TENNESSEE VALLEY AUTHORITY,) [Page 2594-2843]
)
Defendant.)

)

TRANSCRIPT OF TRIAL PROCEEDINGS
BEFORE THE HONORABLE LACY H. THORNBURG
UNITED STATES DISTRICT COURT JUDGE
JULY 29, 2008

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1 P R O C E E D I N G S

2 THE COURT: All right. Let's have our witness
3 come back around.

4 All right. Mr. Fine?

5 MR. FINE: Thank you, Your Honor.

6 THE COURT: You may proceed.

7 DIRECT OF EXAMINATION CONTINUED OF DAVID GRIGAL

8 BY MR. FINE:

9 Q. Dr. Grigal, when we left off your testimony on
10 Friday, I believe you were summarizing your testimony
11 concerning the measurable impacts from the change in
12 deposition under North Carolina's own numbers, the alleged
13 delta deposition.

14 Just as a starting point, could you just refresh our
15 recollection as to your conclusion there?

16 A. Yes. As you recall, I used a number of different
17 studies to try to determine what a delta deposition would
18 do to ecological effects, and concentrating on soil base,
19 or ANC, acid neutralizing capacity of water. And, in the
20 end, at least the numbers that I found in the literature
21 and deduced from the literature, indicate that by using
22 the alleged delta deposition from all the studies that
23 Dr. Driscoll cited, it would take about 2,000 years to
24 move the soil base saturation to an amount that we could
25 potentially measure, and it would take at least 200 years

1 to move these water chemistry acid neutralizing capacities
2 to a point we could measure. If, instead, we used the
3 averages for the North Carolina studies from Dr. Driscoll,
4 we increase those numbers to about 5,000 years for base
5 saturation and about 500 years for water.

6 So it's going to take a very long time to, if we
7 believe the studies that have been done, to erase the
8 impact of the last 100-plus years of acidic deposition in
9 the Southeast.

10 Q. Dr. Grigal, moving from that, if I could, to some
11 questions on mercury deposition.

12 A. Yes, sir.

13 Q. In general terms, your conclusions about mercury
14 deposition, are they similar to your conclusions about
15 acid deposition?

16 A. I think that would be a good summary, yes. They're
17 similar. That is, the amount of increased alleged delta
18 deposition -- again, I used the North Carolina numbers
19 from Dr. Driscoll's report -- that amount would be
20 immeasurable and have a trivial ecological impact.

21 Q. Sir, if we could spend a few moments, and if you
22 would please describe for us something in the mechanics of
23 mercury transport and deposition.

24 A. Yes. Dr. Driscoll has covered some of this.

25 Obviously, it's admitted, what comes up must come

1 down. But in the case of mercury, we have a situation
2 where there's a very large global pool, and the best
3 numbers around -- there is no way to put a little sign on
4 a mercury molecule and send it up and watch where it
5 lands. We have to use modeling or some other technique.
6 And the best models that are out there indicate that in
7 the U.S., in continental U.S., not just North Carolina,
8 only about 30 percent of the mercury that is emitted in
9 the U.S. is deposited in the U.S. The bulk of our
10 deposition comes from international sources, especially
11 Asia. Asia, Europe, Africa, but especially Asia.

12 So that every molecule that is emitted in, let's say,
13 North Carolina, for every three molecules, perhaps one
14 will land. And, in fact, there have been some modeling
15 studies that indicate in smaller regional areas that that
16 number may be even less.

17 There's been no studies in the Southeast, but in New
18 York and New Jersey, Wisconsin, Minnesota, only about 10
19 or 15 percent of the mercury that's emitted is projected
20 to fall in those states.

21 Q. Dr. Grigal, have you attempted to construct an
22 estimate of TVA's contribution to mercury deposition in
23 the Southeast?

24 A. Yes. And Dr. Driscoll and I have some disagreement
25 about my approach, because I began my approach assuming

1 that something like 30 percent of the emissions would be
2 deposited. He objected to that. So, to be conservative,
3 I decided to assume that a hundred percent of the alleged
4 delta deposition were redeposited in North Carolina. This
5 is clearly an upper boundary that's unlikely to occur.

6 Q. How much mercury are we talking about in that hundred
7 percent figure?

8 A. The average wet deposition of water -- the mercury in
9 water that's collected in the Southeast in North Carolina
10 and Tennessee monitoring stations, the average is about 10
11 or 11 micrograms per meter squared. 10 or 11. If I
12 assume all of the delta deposition is -- all the delta
13 emission is deposited, that would add 0.4 micrograms to
14 the background of 10 or 11 as an average.

15 But then we have to understand that this 10 or 11 is
16 accompanied by what we've talked about last time. Noise.
17 There is a lot of variability.

18 Any given station in the Southeast that monitors
19 mercury, from year to year, there may be as much a
20 difference as 5 micrograms per meter squared. As much as
21 5. Or any given year, if we look at all the sites, the
22 difference among sites is up to 5 micrograms per meter
23 squared.

24 So we're looking at 0.4, assuming 100 percent of the
25 alleged emission is deposited, 0.4, and in this background

1 of noise of 10 plus or minus 5.

2 Q. So if I understand correctly, then the amount of --
3 if 100 percent is the alleged delta deposition deposited
4 in the Southeast, we're talking about a number that could
5 be lost in the noise?

6 A. Very lost in the noise, really immeasurable, simply
7 because it's too small to see above the noise.

8 Q. How detectable is the alleged delta deposition in
9 terms of -- you're talking about, I think you said, a
10 number 0.04.

11 A. 0.4.

12 Q. 0.4?

13 A. 0.4.

14 Q. And how detectable would that be in the field?

15 A. Well, as I say, because of the noise, if you measured
16 a sample of water, of precipitation, you might see a
17 difference between two samples. You measure one sample
18 and it would be, let's say, 10.4, and the other would be
19 10, and you say, ah, there it is. But chances are, if you
20 put the same two samples back through the machine, one
21 would come out at 10.4 and the other would come out at
22 10.8. That is, there's enough variability that we just
23 couldn't detect it.

24 Q. In your professional opinion, what would be the
25 impact on the natural system from this 100 percent

1 deposition of the alleged delta deposition?

2 A. Well, I followed through. Although I believe that,
3 undetectable in deposition, I used some reasonable
4 estimates from the literature of the amount of mercury
5 that falls on the landscape that reaches aquatic systems.

6 And as Dr. Driscoll in his testimony discussed,
7 methylmercury is the critical mercury species, not
8 mercury, any kind of mercury, but methylmercury.

9 So I assumed this alleged delta deposition, or
10 alleged emissions leading to deposition, the proportion of
11 it entering the aquatic system. I then assumed all of
12 that would become methylmercury. Again, a very unlikely
13 scenario.

14 Q. If I could interrupt you very briefly, and I
15 apologize for doing so, how much of the mercury is
16 actually deposited and does current science show getting
17 into aquatic systems?

18 A. About 5 to 10 percent of the mercury that's deposited
19 in terrestrial systems gets into aquatic systems. Some of
20 it goes back into the atmosphere, is re-evaporated, as it
21 were, vaporized. Some of it is tied up in the soil
22 organic matter very tightly and is unlikely to leave. So
23 only about 5 or 10 percent get into aquatic systems.

24 Q. And before I interrupted you, I believe you were
25 talking about assuming the unlikely prospect of

1 100 percent of mercury deposited being methylmercury.

2 A. If we assume that the run-off, the waters running off
3 the terrestrial to the aquatic system, contained this
4 methylmercury, where this mercury was all methylated, and
5 we further assume that fish, for some reason, would only
6 swim in that water -- you can understand when that water
7 enters a lake or a stream it's being diluted by other
8 waters -- but if somehow that water stayed in a capsule
9 and a fish swam in there and lived in that piece of water,
10 without any dilution, then again using information from
11 the literature, I can calculate how much that would change
12 the fish level of mercury, mercury in the fish tissue, and
13 it would change -- based on data from more than one study,
14 it would change the amount of mercury in the fish by about
15 one-tenth of what the EPA criterion is for fish tissue.

16 When EPA -- or excuse me. When states issue mercury
17 advisory warnings, they often use a number that EPA has
18 promulgated, 0.3 micrograms per gram of mercury in fish.
19 0.3. And by my computations, being very conservative,
20 giving everything methylated and the fish living only in
21 that water, it would increase fish tissue by 0.04
22 micrograms. So about 10 percent.

23 Q. About 10 percent of the EPA --

24 A. Of the EPA limit.

25 Q. With all those conservative assumptions?

1 **A.** With all those conservative assumptions. And again,
2 boy, it would be tough to try to distinguish between 0.26,
3 let's say, and 0.30 in an analysis consistently and
4 routinely.

5 **Q.** Did you attempt to assess the impact of TVA mercury
6 depositions, or I should say mercury deposition, from TVA
7 emissions, using alternative deposition numbers?

8 **A.** Well, I did -- as I said, Dr. Driscoll and I
9 disagreed in our expert reports, so I did, as part of my
10 report, use a, what I believe a scientifically more
11 reasonable number, that only about 30 percent of the
12 emissions returns to North Carolina and adjacent states.

13 And all these numbers I've given you, then, would
14 have to be reduced by at least a third, because all the
15 other assumptions remain the same. That is, if all of
16 that were methylated, if all that were taken up by fish,
17 et cetera, et cetera, then we're down to only a third of
18 the number that I talked about before.

19 So before I was talking about 0.04 [sic] as compared
20 to 0.39, talking about 0.01. So 30 times -- one-thirtieth
21 of the EPA standard.

22 **Q.** Dr. Grigal, we've heard some testimony from
23 Dr. Driscoll concerning the role of sulfate in the
24 methylation of the mercury.

25 **A.** Yes.

1 Q. Did you review that, both in his report and his
2 testimony?

3 A. Right.

4 Q. Sir, would you agree that -- and as Dr. Driscoll I
5 think ultimately said -- that there are a number of
6 factors which influence the methylation of mercury in
7 natural systems?

8 A. There are a number of necessary factors. That is, we
9 must have enough or adequate conditions. As Dr. Driscoll
10 outlined in his testimony, it was 5 or 6 factors. And you
11 can't have methylation proceed without all of those being
12 present at the correct amount.

13 It's not as if you are cooking a stew and you leave
14 out the carrots and it still tastes pretty much the same.
15 In this case, it's like baking a butter biscuit. Very few
16 ingredients, but if you leave one out, you're not going to
17 get success.

18 Q. What is the relationship between the presence of
19 sulfate and methylmercury production?

20 A. The sulfate is essential for methylmercury
21 production; microbes, microorganisms, bacteria. In the
22 process of reducing sulfate, chemically altering sulfate,
23 as a byproduct, methylated mercury. And so you definitely
24 need sulfate, but you also need mercury. You need an
25 energy source for those microbes and a lack of oxygen. If

1 they have oxygen, they simply don't operate. You need
2 correct temperatures.

3 Q. If you add a unit of sulfate, do you get an
4 additional unit of methylated mercury?

5 A. No. And in fact, I've talked to some folks who are
6 microbiological experts and I can't find anyone that would
7 give me any kind of an estimate of what we would call a
8 stoichiometry of the relationship, that is, how much
9 mercury is generated by the consumption of how much
10 sulfate.

11 Q. Have you reviewed the literature on that point?

12 A. Yes, I have. And as I say, I've consulted with some
13 folks who seem to know a lot more about it than I do,
14 about that particular point.

15 Q. Are there -- have the -- does the literature reflect
16 different results for methylation of mercury with the same
17 sulfate deposition?

18 A. I think that -- I think there are at least three --
19 three points of reference we could use to -- although, it
20 may be theoretically, ideally, sulfate and mercury are
21 linked in methylation, they say these other factors enter.
22 So there are three points of evidence I'd like to
23 consider.

24 One is the study that Dr. Driscoll strongly cited by
25 Jeremiason in Minnesota where they sprayed sulfate on a

1 wetland to see if they could enhance mercury methylation,
2 and Dr. Driscoll, in his report, stressed the fact that
3 they achieved that; they did increase methylation by
4 spraying sulfate.

5 He failed to really emphasize, however, that the
6 success was only one success out of five attempts. The
7 other five attempts -- the other four attempts were
8 unsuccessful, and the reason given by the authors of the
9 paper was that other factors, if it was too cold or if it
10 was too dry or if it was too this or it was too that --
11 well, that simply reinforces, in terms of my judgment,
12 that you need everything working perfectly to get
13 methylation.

14 Another piece of evidence is in my report, Exhibit
15 410. On page 52, I have a figure, a graph. You can look
16 at it or not. But it's a bar diagram showing lakes in
17 Wisconsin that are adjacent to one another, you know, very
18 similar. They're within the same geographic area. They
19 receive the same sulfate deposition; they receive the same
20 mercury deposition, the same climate, and, yet, they have
21 markedly different levels of methylmercury in the fish in
22 those lakes. Why? Because something else besides sulfate
23 and mercury are necessary, and some combination of that
24 recipe exists differently amongst the watersheds leading
25 to those different lakes.

1 And a third piece of evidence that I've just recently
2 been involved with was some work in Minnesota where mining
3 of some bodies of ore leads to sulfates being released
4 into aquatic systems. And there is concern that these
5 additional sulfates being released from mining will
6 enhance methylation. But the mining in some areas has
7 been going on for decades and decades and decades.

8 And so we have water samples with methylmercury and
9 sulfate from a wide variety of waters, some of which have
10 been exposed to the sulfate from mining, some which
11 haven't. They've all been exposed to the same sulfate
12 deposition and mercury deposition. And I've done some
13 statistics on those for another project, and there is no
14 clear relationship between sulfate levels and
15 methylmercury levels in those samples. That is,
16 methylmercury may be very high in an aquatic system that
17 has very, very low sulfate and may be very low in an
18 aquatic system that has high sulfates. There is no
19 one-to-one link.

20 Q. One other topic I'd like to get into with you for a
21 moment or two, Dr. Grigal, is a matter again raised by
22 Dr. Driscoll in terms of the relative amounts of oxidized
23 mercury and elemental mercury emitted by some of TVA's
24 fossil-fired plants.

25 A. Yes. Dr. Driscoll, in fact, I think had an exhibit

1 in his testimony showing the amount of oxidized mercury
2 potentially being emitted from some of the TVA plants
3 based on estimates from their group. And in his report,
4 he cites five TVA facilities that are quite close to the
5 Smokies, Great Smoky Mountains National Park, that have,
6 according to that table, fairly high oxidized mercury
7 emissions. And he said --

8 Q. If I could interrupt -- and I apologize again, sir.
9 But what is the importance of the distinction between
10 oxidized mercury and elemental mercury?

11 A. To repeat what Dr. Driscoll testified, the elemental
12 mercury is not soluble in water. It's sort of inert.
13 It's the kind of mercury we played with in chemistry labs
14 when we were kids. And it evaporates, but it does not
15 deposit to ecosystems very easily. On the other hand, the
16 oxidized mercury is quite reactive and it deposits quite
17 rapidly to ecosystems. As a result, the atmosphere has
18 about 99 percent elemental mercury and only about
19 1 percent oxidized mercury because it's deposited so
20 quickly.

21 Q. I think you were talking about the five plants that
22 Dr. Driscoll identified.

23 A. Yes. And he stated that it's very, very likely that
24 there's sort of rings of local deposition from this
25 elevated oxidized mercury being emitted by these plants,

1 so that one could detect within a 200-mile radius of these
2 plants a signal from the oxidized mercury.

3 Fortunately, in the literature, we have some
4 measurements taken in the Smoky Mountain National Park on
5 Look Rock, and at Look Rock -- that's not 200 miles from
6 these plants in question. It's less than 100 miles. I
7 think the average distance from the power plants is
8 something like 80 miles. And Kingston and Bull Run are
9 even closer than that. And Valente and colleagues looked
10 at the composition of the atmospheric mercury at Look Rock
11 for a summer. I believe it was 2002 or 2003. I just
12 don't have it here. It's in my report.

13 In any event, they found that the composition of the
14 atmosphere at Look Rock, less than 200 miles, less than a
15 hundred miles from these offensive TVA plants, was exactly
16 like any rural area monitored around the world, about
17 99 percent elemental mercury, less than 1 percent reactive
18 mercury. Or oxidized mercury. That is, there was no
19 signal from those plants.

20 When I did my expert report, I saw Dr. Driscoll's
21 data on oxidized emissions, I saw Valente's data on
22 measurements, and a little bit sticky link between the
23 two, but that's what the data shows. However, in looking
24 over the plaintiff's exhibits, Exhibit 50 I believe cites
25 some studies that indicate that there are a number of

1 chemical reactions that occur within the plume.

2 That is, after the emissions leave the smokestack
3 itself, in the plume, you have a number of chemical
4 reactions that those studies indicate that they reduce the
5 elemental -- excuse me -- the oxidized mercury to the
6 elemental form.

7 If, indeed, that's correct, then it makes sense that
8 even though there is element -- excuse me -- oxidized
9 mercury emissions, that they are transformed very quickly
10 in the plume so that a detector at Look Rock or some other
11 spot wouldn't see that signal, the implication being that
12 there wouldn't be as much deposition to the ecosystem
13 then; it would not be a local hot spot of deposition; that
14 mercury would enter the global pool and maybe deposit in
15 China or Afghanistan or Upstate New York.

16 Q. Dr. Grigal, what was your bottom line assessment of
17 the impact of TVA's emissions on mercury depositions in
18 North Carolina?

19 A. As I said in the beginning of this sequence of
20 testimony, it was that the amount in comparison to the
21 background -- again, not the natural, but the
22 anthropogenic background -- is trivial and would be
23 undetectable in the ecosystems in North Carolina and
24 adjacent states.

25 MR. FINE: No further questions, Your Honor.

1 THE COURT: All right.

2 MS. LYNCH: I have a few questions for Dr.
3 Grigal.

THE COURT: You may proceed.

5 MS. LYNCH: Thank you.

CROSS EXAMINATION

7 BY MS. LYNCH:

8 | Q. Good morning, Dr. Grigal.

9 | A. Good morning.

10 Q. I'd like to start by talking a little bit about the
11 ecosystems in the Southeast that we've been discussing on
12 Friday and this morning.

13 You agree, do you not, that there are high elevation
14 forests in the Southern Appalachians that are, in fact,
15 sensitive to disturbances, which includes acid deposition?

16 A. We get to what I tried to stress in my supplementary
17 report and, indeed, in my original expert report, that
18 sensitivity, to me, means that it's -- that a system is
19 easily altered from its present state. And I don't recall
20 what the exhibit number is. It's a titration curve.

21 My titration curve was designed to help the readers
22 and me understand that a sensitive ecosystem then would be
23 at a tipping point, would be at a point where a little
24 more of something creates a large change.

25 I would agree that some of the high elevation

1 ecosystems in the Southeast may have very well been
2 sensitive in 1600 or 1700, or when the first European man
3 or the first Native Americans set foot on them, but in
4 2008 those ecosystems are no longer sensitive because
5 they've been pushed over their tipping point and they're
6 now at a new stable equilibrium. So I prefer a term such
7 as historically sensitive or some term like that.

8 Q. I'd like to turn your attention to Plaintiff's
9 Exhibit 176.

10 MS. LYNCH: May I approach, Your Honor?

11 THE COURT: Yes.

12 Q. (By Ms. Lynch) Got it?

13 A. I got it. And I ought to be able to find the number.

14 Q. I'd like to turn your attention to what's marked in
15 that exhibit as page 37. It's actually the fifth page in
16 of that excerpt.

17 A. 37. All right.

18 Q. In the second column on that page, about two-thirds
19 of the way down, the National Park Service here has stated
20 that, quote: Most high elevation parks, streams and soils
21 are highly sensitive to acidification, with little ability
22 to neutralize acids resulting from nitrogen and sulfur
23 pollution.

24 Do you find that?

25 A. I found that. I found that quotation. And if I just

1 removed -- I altered the word "highly sensitive," took out
2 that phrase and said "most high elevation streams and
3 soils have little ability to neutralize acids," I think
4 I'd be comfortable with that.

5 As I say, they've reached a new stable point. And we
6 talked in my testimony about the lakes in the Adirondacks
7 that became acid in 1950 and after that point didn't
8 become any more acid, even though they were subjected to
9 tens of kiloequivalents more of acidic deposition, because
10 they had already reached that acidic state. They were no
11 longer sensitive. Their sensitivity had been destroyed,
12 in a sense.

13 And so we read a lot in the literature, both the
14 popular literature, the semi-popular literature, and the
15 scientific literature, about sensitive systems. But in my
16 mind, the definition of a sensitive system is one that is
17 easily injured, easily kicked over, not one that has been
18 injured or has been kicked over.

19 Q. Thank you.

20 You are aware that the Southern Appalachian Mountains
21 receive one of the highest rates of acidic deposition in
22 the United States? Is that correct?

23 A. Yes. I think that's a reasonable statement.

24 Q. And the National Park Service, in fact, has found
25 that the Great Smoky Mountains National Park receives the

1 highest sulfur and nitrogen deposition of any monitored
2 national park in the country?

3 **A.** I don't know if I'm aware of that, but I would not
4 argue with those data.

5 **Q.** Okay. And were you also aware that the acidity at
6 the Great Smoky Mountains National Park in the rainfall is
7 five to ten times more acidic than natural rainfall?

8 **A.** Yes. Of course, there are some tricks in the math of
9 pH and acidity and things like that, but it's certainly
10 more acid than natural rainfall.

11 **Q.** And that the cloud water at the Great Smoky Mountains
12 National Park has been measured as low as 2 on the pH
13 scale?

14 **A.** Yes. Again, I don't have that those data, but I'm
15 not surprised by that number.

16 **Q.** Okay. Are you also aware that the National Park
17 Service, in the document that we were just looking at, has
18 found that the health of these high elevation ecosystems,
19 especially in the Great Smoky Mountains National Park, is
20 in jeopardy?

21 **A.** I think that it is reasonable to believe that 150
22 years of acidic deposition has injured those ecosystems.

23 **Q.** You talked just now, and I believe on Friday quite a
24 bit, about the historic acid deposition for the last 100
25 or more years --

1 **A.** Yes.

2 **Q.** -- has been going on at these sites. Is that
3 correct?

4 **A.** Yes. Yes, I did.

5 **Q.** Did you do anything to look at the relative
6 contributions from different sources to that historic
7 deposition?

8 **A.** No. In fact, the table that we used as an exhibit in
9 my testimony, Table 4, that provides estimates of TVA's
10 and North Carolina's contribution, was developed at, I'm
11 sure, some expense and effort by sort of sophisticated
12 modeling techniques for only one year, 2002, and I know of
13 no other kind of sophisticated modeling that would allow
14 us to apportion past deposition.

15 My statistical technique to estimate past deposition
16 was straightforward, but there's certainly devil in the
17 details that I don't have a handle on.

18 No, I do not know what the respective proportional
19 contributions are to that historic deposition.

20 **Q.** So you didn't consider TVA's past SO₂ or NO_x
21 emissions?

22 **A.** In fact, I found that when I did my, call it modeling
23 because it sounds fancy, of the estimates of past
24 deposition, I used the U.S. emissions -- not even the
25 regional emissions, not the emissions from North Carolina,

1 but the emissions from all of the United States -- simply
2 because I'm unsure and I think the community is unsure,
3 even though they think they are, about how much emissions
4 are actually deposited at any point.

5 So rather than worry about that, I used emissions
6 from the entire U.S. to develop my estimates and found
7 both relationships with emissions from the entire U.S.
8 over the period 1980 to 2005, emissions from the whole
9 U.S., and deposition to specific sites in the Southeast.

10 Q. I just want to make sure I understand your testimony,
11 Dr. Grigal.

12 When you look -- compared to what you termed "the
13 delta deposition" from TVA's coal-fired power plants to
14 historic deposition, you looked at the emissions from all
15 sources in the country?

16 A. Yes.

17 Q. Is that what you said?

18 A. Yes. I used the EPA inventory of emissions of SO₂ or
19 NO_x for the entire U.S. to develop the relationship, and I
20 tested that relationship then from the data where we do
21 have good monitoring, that is, from 1980 to 2005. I then
22 back-calculated for the historic deposition.

23 So, as I stated in my testimony, certainly the kinds
24 of stacks, the kind of combustion, the kind of technology
25 has changed from 1900 to 1980 to 2008. So I certainly

1 understand that my line -- if we think back to the
2 exhibit, my line gets fuzzier and fuzzier as we go into
3 the past. But the point is, there is no question that it
4 goes upward. It does not go downward. It does not go
5 flat. It continually goes upward, to the present.

6 Q. But you didn't break out any particular source in
7 looking at those historic --

8 A. I did not.

9 Q. -- depositions?

10 A. I did not.

11 Q. Okay. Like to turn your attention to TVA's Exhibit
12 415, which I believe you talked about on Friday.

13 A. Okay. I have it.

14 Q. I'd like to talk to you about this table for just a
15 couple minutes, if I may.

16 A. Sure.

17 Q. In this table, you analyze the relative contribution
18 of TVA versus all North Carolina emissions at various
19 receptor sites. Is that correct?

20 A. That's too nice a word. I didn't analyze it. I
21 presented the data that I had received from the TVA
22 modelers in columns -- in the columns -- contribution in
23 2002. Those percentages I received from the TVA modelers
24 and I presented them in this table, yes.

25 Q. You created this table --

1 **A.** I created this table and --

2 **Q.** -- based on those results?

3 **A.** -- in fact, I used my -- we talked in earlier
4 testimony about kiloequivalents. So I converted the
5 numbers that I was given in terms of nitrates and sulfates
6 to kiloequivalents. Yes, I did.

7 **Q.** And the site names are listed on the left side of the
8 table, with five sites from North Carolina.

9 **A.** Correct.

10 **Q.** And there's only two sites in Tennessee and one site
11 in Kentucky; is that correct?

12 **A.** Correct. These are the sites that Dr. Driscoll used
13 in his Table 9 in his expert report, and so throughout my
14 report I used the same sites. I didn't look for other
15 sites. I didn't drop any of the sites. I used all the
16 sites that Dr. Driscoll used in his report.

17 **Q.** And then, I believe it's the third column over, you
18 have the contribution in 2002 from TVA's emissions.

19 **A.** Yes, ma'am.

20 **Q.** And then the next column you compared TVA's
21 contribution with the contribution from all sources in
22 North Carolina.

23 **A.** All anthropogenic sources in North Carolina.

24 **Q.** And all anthropogenic sources would include all
25 industrial sources?

1 **A.** Yes. Again, I didn't model this, develop the
2 numbers. The way I understand it, it included not only
3 power plants, but other sources.

4 **Q.** Including all motor vehicles in the state?

5 **A.** I suspect that that's correct, yes. That's the way I
6 understood it when I received the data.

7 **Q.** And it also would include, for example, all area
8 sources and all non-motor vehicle -- every source that we
9 can --

10 **A.** Right. Right. That's my assumption, yes.

11 **Q.** And in this table, there is no comparison of TVA's
12 contribution to the contributions of any other
13 electric-generating power system?

14 **A.** Not in this -- not in this table, no. The
15 electric-generating systems in North Carolina would be
16 subsumed into that column of all of North Carolina.

17 **Q.** And you didn't present that comparison elsewhere in
18 your report either?

19 **A.** No, I do not recall presenting that comparison. I
20 don't recall. I may have, but I don't think I did.

21 **Q.** This table shows, on the line that's marked TN11
22 Elkmont --

23 **A.** Yes, ma'am.

24 **Q.** -- that site is the site at the Great Smoky Mountains
25 National Park?

1 **A.** Yes.

2 **Q.** And you show that TVA contributed over 15 percent of
3 the acid deposition to that receptor site.

4 **A.** Yes. Yes. In 2002. Yes, ma'am.

5 **Q.** And in fact, you show on the further right column
6 that TVA contributes to acid deposition at all the
7 receptor sites that are listed on this table.

8 **A.** Well, TVA certainly contributes to all the receptor
9 sites in that table, yes.

10 **Q.** And you would agree with me, would you not, that
11 reductions from individual sources result in reductions in
12 acid deposition at that location?

13 **A.** If we believe, as Dr. Driscoll stated in his
14 testimony, the conservation of mass, what comes up must
15 come down, then any reduction in emissions should lead to
16 a reduction in deposition.

17 However, as my testimony has indicated, I think we
18 may have immeasurable changes, depending on the background
19 noise and depending on absolute amounts. So we may not be
20 able to measure it; we may not be able to taste it or feel
21 it. The question is, does it exist?

22 **Q.** You've talked quite a bit about this noise, as you
23 call it, which I take it to mean the variation from year
24 to year or the variation from site to site in
25 measurements?

1 **A.** And, actually, the variation in the laboratory from
2 measurement to measurement. Again, laboratories aren't
3 perfect and numbers from laboratories, as some people who
4 have medical problems know, sometimes bounce around quite
5 a bit for no reason.

6 **Q.** And you would agree with me, would you not, that just
7 because a change might be within what you call the noise,
8 that does not necessarily mean that it's biologically
9 insignificant. Isn't that right?

10 **A.** You certainly could have a measuring device that's
11 quite crude so that we have a lot of noise and yet have a
12 biologically significant ramification. Probably could
13 think of an analogy but I won't right now.

14 But it depends on the sophistication of the
15 measurement -- the metric we're using to measure that
16 biological response and the response of the biological
17 system to that method, whatever that method is.

18 **Q.** I'd like to refer you to the transcript of the
19 deposition that you gave in this case.

20 **A.** Okay.

21 **Q.** And it's pulling up on your screen here. It's page
22 124, starting at line 17, through page 125, line 7.

23 And I asked you, if you look at, starting on page 125
24 at line 4:

25 "So the fact alone that it might not be measurable

1 against the background noise does not" --

2 A. I don't have line -- oh, line 4. Okay. Gotcha.

3 Gotcha. All right.

4 Q. So the question was:

5 "So the fact alone that it might not be measurable
6 against the background noise does not automatically mean
7 that it's" -- oh, it cut off your answer there. Just a
8 second.

9 I apologize. This is not what I thought it was.

10 Okay. If we look at page 124, starting at line 25,
11 to 125, line 3, and I believe that this is your answer,
12 and you say:

13 "There are, and I would agree with you, two different
14 issues here: One, can you measure it? One, does it
15 affect the system? And I tried to keep those separate."

16 So those are two separate issues; is that correct?

17 A. Yes. Those are certainly two separate issues, yes.

18 Q. You would also agree with me, would you not, that a
19 decrease in emissions from a point source, including TVA's
20 coal-fired power plants, can result in a decrease in acid
21 deposition. Is that correct?

22 A. Yes. I think we've covered that before. Yes, I
23 would agree.

24 Q. Okay. And you also agree that if more reductions are
25 made, we would logically see more reductions in acid

1 deposition at those sites.

2 A. I think I agree with that, yes. I do agree with
3 that.

4 Q. And you're also familiar with the Southeastern
5 Appalachian Mountains Initiative.

6 A. Yes, I am.

7 Q. I believe we talked about it a little bit in your
8 deposition. And you have no reason to disagree with
9 SAMI's geographic sensitivity conclusions; is that
10 correct?

11 A. Well, yes, I have no reason to disagree. And in my
12 expert report I took a quote from SAMI, in fact. On page
13 28 of my expert report, I directly quoted from SAMI's
14 final report, and that was the, sort of a glossy -- a
15 glossy -- and SAMI concluded, at least the citation I
16 have, the current state of science does not allow us to
17 definitively project biological responses in the fish or
18 forests to changes in acid deposition. And this is with
19 SAMI's extremely vigorous reductions in deposition,
20 beyond-all-bones deposition -- beyond-all-bones emission
21 reduction that led to deposition. Yet they concluded, the
22 SAMI experts, of whom there were many, the current state
23 of science does not allow us to definitively project
24 changes in forests or fish.

25 And I can't argue with that. As you said, I can't

1 argue with SAMI's conclusions.

2 Q. And you also don't disagree with SAMI's conclusion
3 that annual average sulfate particle mass at the Great
4 Smoky Mountains National Park and at Joyce
5 Kilmer-Slickrock, Shining Rock, and Linville Gorge
6 Wilderness Areas in western North Carolina are most
7 influenced by sulfur dioxide reductions in Tennessee?

8 A. I -- if I were to read that, I would assume that
9 dealt with issues such as visibility or PM2.5 or something
10 like that that are not in -- I'm not sure that sulfate
11 mass in an air, in a volume of air, directly translates,
12 in my understanding, to either sulfate deposition and/or
13 ecological impacts.

14 Q. But sulfate from the air does, in fact, deposit to
15 the landscape, correct?

16 A. It certainly does. And dry deposition, as
17 Dr. Driscoll discussed, I believe, is an element of acid
18 deposition.

19 And most folks who want to get a ballpark number
20 simply double wet deposition to arrive at a reasonable
21 estimate, perhaps, of dry deposition. Or a total
22 deposition -- excuse me -- when it was dry.

23 Q. In forming your opinions here, did you consider
24 studies that were done by the National Forest Service and
25 the National Park Service on critical loads for several of

1 the high elevation forests in North Carolina and Tennessee
2 that we've been talking about?

3 **A.** Actually, just recently, and I mean probably less
4 than a week ago, I happened to get a scientific journal
5 and found a paper by Elliott, et al, including one of the
6 authors was Mr. Jackson who testified a week or two ago,
7 which looked at Shining Rock, Linville Gorge, and Joyce
8 Kilmer.

9 And, apparently -- my assumption, although I don't
10 even know -- I did look at the paper -- whether they were
11 explicitly looking at critical loads or just modeling the
12 response to those systems for changes in acidic
13 deposition. And what struck me was that, in their figure,
14 wherever it is, toward the back of the paper, the base
15 saturation of soil, which is one of the metrics I used,
16 really, scarcely changed whether they increased deposition
17 by 100 percent, left it the same, or decreased it by
18 50 percent. There were changes, yes, over a 30-year
19 period, but they were very, very small changes.

20 **Q.** I'd like to show you what we've marked as Plaintiff's
21 Exhibit 494. And it's not in your book, but I have a copy
22 for you here.

23 **A.** Okay. Fine.

24 **MS. LYNCH:** Your Honor, if I may approach, I
25 have a copy of this study for the Court and for the

1 witness.

2 THE COURT: All right.

3 MR. FINE: Do you have a copy for counsel?

4 MS. LYNCH: Yes.

5 Q. (By Ms. Lynch) And this is just the executive
6 summary of a --

7 A. Yes.

8 Q. -- longer report.

9 And you can see on the cover page it was performed by
10 individuals at the U.S. Forest Service for the Tennessee
11 Valley Authority, the Great Smoky Mountains National Park,
12 and the National Park Service.

13 A. Yes, I see that.

14 Q. If you'll turn to page Roman numeral III --

15 A. I have it.

16 Q. -- which is the last page of this excerpt, you'll see
17 the conclusions of this study, which state that deposition
18 reduction of 53 percent of sulfur and nitrogen would be
19 necessary to protect the upper spruce fir site for
20 concerns of acidification. And then it goes on to detail
21 the deposition reductions for nitrogen saturation.

22 Do you see that?

23 A. I do see that.

24 Q. Is this something that you considered --

25 A. No.

1 Q. -- in developing your opinions here?

2 A. No. I did not see this paper.

3 Q. So you didn't consider the magnitude of the delta
4 deposition in relationship to these reductions that the
5 National Forest Service determined were necessary?

6 A. I did not see this report.

7 Q. Okay. Thank you.

8 A. As I stated in my earlier testimony, critical loads
9 are -- there are some valid questions about their
10 application.

11 Q. I'd like to ask you just a few questions about your
12 testimony on mercury deposition.

13 A. Yes, ma'am.

14 Q. Okay. You agree that mercury is a toxic and
15 persistent contaminant in the ecosystem, correct?

16 A. Yes.

17 Q. And it can have toxic effects on wildlife, correct?

18 A. And especially -- or the concern mainly is the toxic
19 effects on humans. But yes, correct.

20 Q. Mercury bio-accumulates in the food chain, correct?

21 A. Correct.

22 Q. And I believe that you testified to this earlier, but
23 just to clarify, the simultaneous presence of various
24 conditions in the environment, including the presence of
25 sulfates, enhances the methylation of mercury in the

1 environment.

2 **A.** I don't think that's a good word. I think it's
3 necessary; that is, the presence of all of these
4 ingredients are necessary. No any one of the ingredients
5 would enhance, simply because no chain is stronger than
6 its missing link -- or its weakest missing link. You need
7 everything there, including sulfate, including -- and if
8 you have everything just right and add more sulfate,
9 nothing will happen unless something else is also added.

10 **Q.** And you testified a little bit about the different
11 types of mercury, oxidized and elemental mercury.

12 **A.** Yes, ma'am.

13 **Q.** And are you familiar that selective catalytic
14 reduction systems, SCRs, oxidize mercury so that a power
15 plant that has an SCR actually emits more oxidized mercury
16 than one that does not?

17 **A.** You're probing the depth of my ignorance. I'm not an
18 expert on emission control devices. But I hear what
19 you're saying and I have no reason to doubt it.

20 **Q.** And you did not look at any actual data from TVA
21 about the oxidized or elemental mercury emissions from its
22 plants?

23 **A.** I looked at the data from Look Rock, which was
24 located in the vicinity of TVA plants, that showed
25 atmospheric levels of oxidized and elemental mercury, and

1 showed no difference from any other rural area in the
2 world.

3 Q. But TVA did not provide you with stack estimates of
4 their emissions; is that correct?

5 A. No. I had no stack estimates of TVA emissions of
6 relative mercury species, no.

7 **MS. LYNCH:** We have no further questions for
8 Dr. Griqual. Thank you.

9 **MR. FINE:** Just a few matters to cover on
10 redirect, Your Honor. I'll keep it brief.

11 | THE COURT: All right, sir. You may proceed.

REDIRECT EXAMINATION

13 | BY MR. FINE:

14 Q. Dr. Grigal, the document that's been marked for
15 identification as Plaintiff's Exhibit 494, do you still
16 have that before you?

17 A. Yes, I do.

18 Q. And again, turning your attention to the same page
19 counsel asked you to look at.

20 Sir, I know that you haven't seen this before, but
21 can you give us an idea as to how the depositions that are
22 being discussed in this paragraph, how they compare to the
23 alleged delta deposition that we've been talking about for
24 acid deposition?

25 A. Well, if they say -- and I have some concern with the

1 numbers, only because they're saying the current inputs of
2 deposition are 4,271 equivalents per hectare per year.
3 And if we divide that by a thousand, that's 4.2
4 kiloequivalents.

5 If we look at my Table 4 or Dr. Driscoll's Table 9,
6 we find that all of the monitoring stations that either of
7 us mentioned have more on the order of 0.5 or 0.6. So
8 this is at least tenfold more deposition than any of the
9 monitoring stations.

10 I understand, but I don't have the paper, that high
11 elevation sites have more deposition, but a tenfold
12 difference seems to me to be a lot, so I'm sort of taken
13 aback by that number. But I don't have the paper to find
14 out where they got that number from.

15 Now, deposition reduction of 53 percent, however, we
16 can certainly deal with that number. And the alleged
17 delta deposition, at least based on the receptor sites
18 that we have in our reports, Dr. Driscoll and I, alleged
19 delta deposition would change the deposition somewhat less
20 than 1 percent, so that we can compare 53 percent to less
21 than 1 percent.

22 **MR. FINE:** No further questions, Your Honor.

23 **MS. LYNCH:** I just have one question.

24 **THE COURT:** All right.

25 >>>

RECROSS EXAMINATION

1 BY MS. LYNCH:

2 Q. Looking back to TVA's Exhibit 415 -- which I think we
3 can pull up for you.

4 A. Okay.

5 Q. TVA contributed, according to this table, in 2002,
6 over 15 percent of the acid deposition at the Elkmont
7 Great Smoky Mountains National Park site. That's correct?

8 A. Yes. That's what it -- correct, yes, ma'am.

9 Q. And I believe that you also referred to Plaintiff's
10 Exhibit 336, which was from Dr. Driscoll's report. And
11 looking at page 2 of this --

12 A. Yes.

13 Q. This shows the percent reduction that Dr. Driscoll
14 calculated in sulfate deposition and nitrate deposition
15 from the controls on TVA's power plants.

16 Is that your understanding of this table?

17 A. Yes, it is.

18 Q. And if you look at the Great Smoky Mountains National
19 Park Elkmont site, we see, just in the sulfate deposition,
20 an 11 percent reduction.

21 A. I see that, yes, ma'am.

22 MS. LYNCH: Have no further questions.

23 MR. FINE: Nothing further, Your Honor.

24 THE COURT: All right. Thank you, Dr. Grigal.

1 That will conclude your testimony and you are excused.

2 **THE WITNESS:** Thank you.

3 **THE COURT:** All right, sir.

4 **MR. LANCASTER:** Defendant calls Mr. Wyat Appel.

5 **KEITH WYAT APPEL,**

6 **being duly sworn, was examined and testified as follows:**

7 **DIRECT EXAMINATION**

8 **BY MR. LANCASTER:**

9 **Q.** Mr. Appel, could you please state your full name for
10 the record?

11 **A.** Keith Wyat Appel.

12 **Q.** And you and I have met once before, at your
13 deposition; is that correct?

14 **A.** That is correct.

15 **Q.** And you live in the Raleigh area?

16 **A.** Yes.

17 **Q.** And you are appearing here in Asheville today
18 pursuant to a subpoena?

19 **A.** Yes.

20 **Q.** We very much appreciate your traveling over this way
21 to provide testimony.

22 **A.** You're welcome.

23 **Q.** You provided some information at your deposition
24 about some of your work at the North Carolina Division of
25 Air Quality that I'd like to confirm today because I think

1 it's valuable information for the Court to consider in
2 deciding this case. And I'll try to do it as quickly as I
3 can so we can send you on your way.

4 I will also say that this is not meant to be a memory
5 test, and so if you would obtain book 7 and book 5 from
6 that bookshelf behind you. And you may move those other
7 books out of the way, if you like. I'm sorry, the books
8 with the white binders.

9 Sir, where do you currently work?

10 A. I currently work for the Environmental Protection
11 Agency.

12 Q. You currently work for the Environmental Protection
13 Agency?

14 A. Yes.

15 Q. And what do you do?

16 A. I work in the atmospheric modeling division. I
17 mainly do evaluation of the CMAQ model.

18 Q. And you have also worked at the National Oceanic and
19 Atmospheric Administration?

20 A. Yes, that's correct.

21 Q. And what educational degrees do you hold?

22 A. I have a bachelor's of science in meteorology and a
23 master's of science in atmospheric science.

24 Q. And those are from North Carolina State University?

25 A. That's correct.

1 **Q.** And in your master's degree program, you took
2 advanced courses in air pollution meteorology?

3 **A.** I did.

4 **Q.** And you consider yourself to be a scientist?

5 **A.** I do.

6 **Q.** Now, during 2003 and 2004, you worked for the North
7 Carolina Division of Air Quality, correct?

8 **A.** Yes.

9 **Q.** And people call that DAQ for short?

10 **A.** Yes.

11 **Q.** Some of your early work at the North Carolina DAQ
12 involved addressing issues having to do with ozone
13 forecasting; is that correct?

14 **A.** Yes, that's correct.

15 **Q.** And during ozone season, the North Carolina Division
16 of Air Quality makes ozone forecasts and presents them to
17 the public; is that right?

18 **A.** Yes.

19 **Q.** When is ozone season?

20 **A.** Primarily, when we're doing it for this region, it's
21 May 1st through September 30th.

22 **Q.** And ozone formation is known as -- is what is known
23 as a photolytic, p-h-o-t-o-l-y-t-i-c, reaction, correct?

24 **A.** Yes.

25 **Q.** And photolytic means sunlight.

1 **A.** Right.

2 **Q.** In fact, ozone formation is both sunlight dependent
3 and temperature dependent; is that correct?

4 **A.** Yes, that's correct.

5 **Q.** And is that why ozone is a summertime phenomenon in
6 this part of the country?

7 **A.** Yes, correct.

8 **Q.** Now, from October through April, when it's not ozone
9 season, that's not a time during which you typically see
10 higher ozone values, is it?

11 **MR. BERNSTEIN:** Your Honor, we're going to
12 object to the leading nature of the questions. This
13 witness is --

14 **THE COURT:** Sustained.

15 **BY MR. LANCASTER:**

16 **Q.** What is your expectation about seeing higher ozone
17 values during October through April?

18 **A.** Generally, we'd expect to see lower observed
19 concentrations during that time period.

20 **Q.** I'd like to ask you about some of your modeling work
21 at the North Carolina Division of Air Quality.

22 Is one of the tools you use there something called a
23 back trajectory?

24 **A.** Yes, that's correct.

25 **Q.** If you could explain to the Court what a back

1 trajectory is, please.

2 A. Basically, we use a model that's available, a public
3 model, and, with that, we can give it a point, and it is
4 able to give us, basically, a point-by-point location of
5 an air parcel back in time.

6 Q. And so could it be used if there were a high level of
7 pollution to trace the air mass backwards from a certain
8 spot to see where the air mass had come from?

9 A. Yes.

10 Q. And in 2004, when you were working for the North
11 Carolina Division of Air Quality, did you prepare a back
12 trajectory analysis to analyze ozone impacts on the air
13 quality monitor located at Ceweeta?

14 A. I believe I did, yes.

15 Q. If you'll look in book 5, at TVA Exhibit 115.

16 A. Okay.

17 Q. Am I pronouncing Ceweeta right?

18 A. I believe so, yes.

19 Q. Is Exhibit 115 a write-up of your analysis at Ceweeta
20 that you prepared while you worked at the Division of Air
21 Quality?

22 A. It appears to be, yes.

23 Q. And where is Ceweeta?

24 A. I can't say precisely. I do know it's located
25 between -- generally between the Charlotte and triad

1 regions of North Carolina.

2 Q. So would it be Winston-Salem?

3 A. Yeah. I think it may be a little south and west of
4 Winston-Salem. Roughly in that region.

5 Q. And in this report, you analyzed days from
6 1999 through 2003 when observed 8-hour average ozone --

7 MR. BERNSTEIN: Your Honor, we're going to
8 object again to the leading nature of these questions.

9 MR. LANCASTER: Your Honor, I'm just trying to
10 move through some work that this witness did while
11 employed with the plaintiff and helping him to summarize
12 his findings.

13 THE COURT: Well, let's let him do the
14 testifying.

15 BY MR. LANCASTER:

16 Q. If you could explain to the Court what you did in
17 this analysis.

18 A. Well, it's been quite some time since I've seen it,
19 but it appears that I looked at days during which there
20 was high ozone between, it appears to be in, 1999 through
21 2003, at the Coweeta site.

22 Q. And what was the conclusion that you reached? Do you
23 recall?

24 A. I don't recall specifically. But I'm looking at this
25 here. It appears that there is -- basically decided --

1 was looking at the influence of Ceweeta from neighboring
2 regions, and in this case Charlotte and the triad, and
3 then other regions as well.

4 Q. In other words, you determined that when ozone
5 concentrations at Ceweeta were highest, the main
6 contributor of ozone and precursor pollutants was the
7 Charlotte region, correct?

8 MS. LYNCH: Your Honor, again, we're going to
9 object to the nature of these questions. They're leading.

10 THE COURT: Yes. Sustained.

11 MR. LANCASTER: Let me rephrase, Your Honor, to
12 help the witness refresh his recollection.

13 THE COURT: All right.

14 BY MR. LANCASTER:

15 Q. If you, sir, would turn in book 7 to your deposition
16 transcript, which should be Exhibit 142.

17 A. Okay.

18 Q. And I'm looking at page 103.

19 A. Okay.

20 Q. On line 10, we were discussing this write-up of your
21 work at North Carolina Division of Air Quality, and I was
22 talking to you about it. Excuse me, line 11. I referred
23 to the document, I said:

24 "Then it goes on and says, 'On those days when the
25 ozone concentration at Ceweeta was highest, the main

1 contributor of ozone and precursor pollutants is the
2 Charlotte region. Do you see that?"

3 **A.** Yes.

4 **Q.** And you said, "Yes."

5 And I said, "And that's true, isn't it?"

6 And you said, "And I would say, based on that
7 analysis, that's probably the case."

8 **A.** Yes.

9 **Q.** And I realize that you've not seen this document in a
10 while, but does that refresh your recollection that your
11 conclusion was that ozone concentrations in this area
12 between Charlotte and Winston-Salem were highest when the
13 main contributor was from the Charlotte region?

14 **A.** Yes, I think that's fair to say.

15 **Q.** I want to switch from ozone now to fine particulate
16 matter, PM2.5.

17 At some point did you undertake a back trajectory
18 analysis to determine the source regions of particulate
19 matter levels in Catawba County and Davidson County?

20 **A.** Yes, I did.

21 **Q.** Was there anything special about those two counties?

22 **A.** I think they were counties that were nonattainment
23 for PM in the annual study.

24 **Q.** And you conducted a series of back trajectories to
25 analyze that situation, didn't you?

1 **A.** Yes.

2 **Q.** And do you recall the PM2.5 levels that were the cut
3 point for the days you examined?

4 **A.** I believe that the lower cut point was 27 and a half.
5 I believe.

6 **Q.** And that is -- I have written down 27.9.

7 **A.** .9? Okay, so --

8 **Q.** And 27.9 is not actually above the air quality
9 standard, is it?

10 **A.** It's above the annual standard; it is not above the
11 daily standard.

12 **Q.** And these were daily values you were looking at?

13 **A.** That is correct.

14 **Q.** In this back trajectory analysis, did you feel like
15 you had a good data set to use?

16 **A.** Yes, I did.

17 **Q.** Did you feel like you had the highest resolution that
18 was available?

19 **A.** Yes.

20 **Q.** And you ran 36-hour trajectories; is that right?

21 **A.** That is correct.

22 **Q.** Was that a reasonable length of time?

23 **A.** For what we were doing for PM, I believe it was, yes.

24 **Q.** Did you have confidence in the trajectories you
25 calculated?

1 **A.** Yes.

2 **Q.** And these back trajectories, is it true that all of
3 the various analyses you performed pointed to North
4 Carolina as the prevailing source region for PM2.5?

5 **A.** I think it would be fair to say, while the
6 trajectories pointed to various regions, North Carolina
7 was frequently a source region, yes.

8 **Q.** If we could look back in your deposition at page 84.
9 We were looking at a write-up of the analysis. On line 4,
10 I asked you:

11 "And in fact, the fact of the matter is, that all of
12 the various analyses performed point at North Carolina as
13 the prevailing source region for PM2.5. Is that true?"

14 And you answered: "Well, it was -- right. I think I
15 removed the "prevailing" and just worded it with "primary
16 source," I think, but, I mean, those statements are in
17 there."

18 And I ask: "And it's true, right?"

19 And you said: "Yeah. I mean, it's in both, so I
20 would say that that, as written, is true."

21 Do you recall that?

22 **A.** Yes.

23 **Q.** So is it true that all of the various analyses you
24 performed pointed to North Carolina as the prevailing
25 source region for PM2.5 for Catawba and Davidson Counties?

1 **A.** Well, as I said, I think it's fair to say that while
2 there was various regions that North Carolina was
3 indicated in the analysis as the primary region source.

4 **Q.** And your write-up indicated that North Carolina was
5 the primary source region for the majority of days you
6 analyzed with these higher PM2.5 readings in Catawba and
7 Davidson Counties; is that correct?

8 **A.** Yes. As I said, I think that's fair to say. We saw
9 various readings that North Carolina --

10 **Q.** And subsequently you summarized this analysis in an
11 e-mail dated December 16th, 2003; is that correct?

12 **A.** I don't recall the e-mail specifically.

13 **Q.** It's TVA Exhibit 86, back in book 5.

14 And about two-thirds of the way down the page on
15 Defendant's Exhibit 86, did you say:

16 "Concerning the trajectories, originally we used the
17 trajectories to show that the majority of the trajectories
18 pointed to North Carolina as the major culprit."

19 **A.** I see that, yes.

20 **Q.** And you wrote those words?

21 **A.** I did, yes.

22 **Q.** While you were employed at the North Carolina
23 Division of Air Quality.

24 **A.** Yes, sir.

25 **MR. LANCASTER:** Your Honor, we move the

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1 admission of Defendant's Exhibits 86 and 115.

THE COURT: Let those be admitted.

3 (Defendant's Exhibits 86 and 115)

4 received in evidence.)

5 **MR. LANCASTER:** We have no further questions for
6 Mr. Appel and very much appreciate his traveling here
7 today to testify.

8 THE COURT: All right.

CROSS EXAMINATION

10 BY MR. BERNSTEIN:

11 Q. Mr. Appel, I'd like to ask you a few questions.

12 Mr. Lancaster was asking you about the Ceweeta study.
13 With regard to that study, was it not the case that that
14 study also showed that there were other source regions
15 that contributed to high ozone days in the Ceweeta region?

16 | A. I believe it did, yes.

17 Q. And those other source regions were potentially in
18 other states?

19 A. Yes. I believe so.

20 Q. Now, Mr. Lancaster also asked you about the cutoff
21 that you used in the PM back trajectory study. Do you
22 recall that question?

23 A Yes

24 Q. And you testified that that cutoff was above the
25 annual standard but below the daily standard

1 **A.** Yes.

2 **Q.** Is it important -- was it important for that study to
3 choose a number that was above the daily -- the annual
4 standard?

5 **A.** No. The monitors were violating the annual standard,
6 so those high values above 27.9 would contribute to the
7 annual standard, which is significantly lower at 15
8 micrograms.

9 **Q.** So would it be correct that even though some of the
10 days at which -- on which you analyzed the data were not
11 days on which there was a violation of the daily standard,
12 that those readings on those days would have contributed
13 significantly to violations of the annual standard?

14 **A.** They would, yeah.

15 **Q.** And in that study you indicated that North Carolina
16 was the prevailing source region for the trajectories with
17 regard to Catawba and Davidson?

18 **A.** Yes.

19 **Q.** Did you have any conclusions with regard to the
20 impacts from other source regions in other states?

21 **A.** Yeah. I think it's fair to say that while North
22 Carolina was a local contributor to the pollution, there
23 was also a non-local that was a fairly significant portion
24 of it.

25 **Q.** And was one of those states that was a potential

1 source region the state of Tennessee?

2 A. It was.

3 Q. And was one of those source regions that was a -- was
4 one of those regions that was a potential source region
5 the state of Kentucky?

6 A. I believe it was, yes.

7 Q. With regard to that study again, what were the dates
8 that were analyzed, the date ranges?

9 A. I don't recall specifically. I'd have to -- I'd have
10 to look.

11 Q. Let me ask it this way. The study was done -- began
12 mid 2003. Was that the first write-up?

13 A. That sounds reasonable.

14 Q. So it would have considered data that was prior to
15 mid 2003, so maybe late '90s or early 2000s?

16 A. Can you repeat the question? Sorry.

17 Q. The data that was considered -- because this study
18 was written up originally in mid 2003, it would have
19 considered data from probably the late 1990s to early
20 2000s?

21 A. Yes.

22 Q. And that data -- and so that data indicated that
23 North Carolina was an important region for PM pollution in
24 North Carolina?

25 A. Correct, yes.

1 Q. In June, 2002, isn't it a fact that North Carolina
2 passed the Clean Smokestacks Act to create fairly sizable
3 reductions in SO₂ emissions that would contribute to those
4 high PM levels in North Carolina?

5 A. I believe so, yes, sir.

6 Q. And when you were doing this study, were you aware of
7 any other studies that looked at interstate transport for
8 pollutants?

9 A. I can't name them specifically. I know that other
10 studies have looked at interstate transport.

11 Q. And was it your understanding from those studies that
12 North Carolina was an important player with regard to
13 pollutant levels in North Carolina but that pollution that
14 comes from other states was also an important factor in
15 the pollutant levels in North Carolina?

16 A. Yes. I believe that's correct.

17 Q. So would you describe your study with regard to the
18 particulate matter back trajectories of Catawba and
19 Davidson Counties as being consistent with the other
20 studies that were done at the time?

21 A. I believe it was, yes.

22 **MR. BERNSTEIN:** We have no further questions,
23 Your Honor.

24 **MR. LANCASTER:** No further questions, Your
25 Honor.

1 **THE COURT:** All right, sir. Thank you. And
2 that will complete your testimony.

3 **MS. LYNCH:** Your Honor, I have one housekeeping
4 matter. I'd like to offer Plaintiff's Exhibit 494, which
5 was the study done by the U.S. Forest Service on behalf of
6 TVA, Great Smoky Mountains National Park, and the National
7 Park Service, which was discussed during Dr. Grigal's
8 testimony.

9 **MR. FINE:** Your Honor, that is an excerpt from a
10 document that we've not previously seen before, and I
11 would object until such time as an entire copy has been
12 provided to us for review.

13 **MS. LYNCH:** I believe that this report was
14 prepared for the Tennessee Valley Authority. However, I
15 do have a full copy of it, if counsel has not seen it.

16 **THE COURT:** You're offering Plaintiff's Exhibit
17 494?

18 **MS. LYNCH:** Yes, Your Honor.

19 **THE COURT:** Yes. I'll overrule that objection.
20 You both had access and opportunity related to that
21 document. Let it be admitted.

22 (**Plaintiff's Exhibit 494 received.**)

23 **THE COURT:** All right. Call your next witness.

24 **MR. LANCASTER:** As the next witness, defendant
25 calls Mr. George Bridgers.

1 **GEORGE BRIDGERS,**
2 **being duly sworn, was examined and testified as follows:**

3 **DIRECT EXAMINATION**

4 **BY MR. LANCASTER:**

5 **Q.** Good morning, Mr. Bridgers. Could you please state
6 your full name for the record?

7 **A.** Yes, sir. First name George, middle name Matthews,
8 with an S, last name Bridgers, with an R-S.

9 **Q.** And you currently work for the North Carolina
10 Division of Air Quality; is that correct?

11 **A.** I do, sir.

12 **Q.** And you are appearing here today pursuant to a
13 subpoena?

14 **A.** Yes, sir.

15 **Q.** As with Mr. Appel, I'm going to be asking about some
16 facts and figures, and I'm not expecting you to be able to
17 remember every single one of them. Unfortunately, I think
18 you have more books than Mr. Appel.

19 If you could obtain books 1, 5, 6, and 8, and hold
20 onto book 7 -- you may need some of those. They're with
21 the white binders?

22 **A.** So 1, 5, 6, and 8. I have them now, sir.

23 **Q.** Thank you.

24 What is your position with the North Carolina
25 Division of Air Quality?

1 **A.** Mr. Lancaster, I'm currently employed as a
2 Meteorologist II, which is also commonly referred to as a
3 senior meteorologist, within the Attainment Planning
4 branch of the North Carolina Division of Air Quality.

5 **Q.** Are you considered the team lead among the division
6 of meteorologists?

7 **A.** The Air Quality Meteorologists within the Planning
8 Section, yes, sir.

9 **Q.** How long have you been employed by the North Carolina
10 Division of Air Quality?

11 **A.** I've been employed by the Division of Air Quality for
12 just a month shy of ten years.

13 **Q.** We had some interesting testimony earlier in this
14 trial from a witness named Mr. Chinkin. He testified that
15 one of his colleagues had proven that air pollution can
16 cross county lines.

17 There is not really any question about that, is
18 there?

19 **A.** There is no question in my mind.

20 **Q.** And in fact, air pollution can cross state lines, can
21 it not?

22 **A.** Absolutely.

23 **Q.** In the state of North Carolina, are there any power
24 plants located near the North Carolina-Virginia border?

25 **A.** Yes, sir.

1 Q. And do you know what those plants are?

2 A. Depending on the distance, I think the most common
3 ones referred to in the closest proximity would be the
4 Roxboro and Mayo plants operated by Carolina Power &
5 Light, CP&L, and then there is also a large facility, an
6 EGU, Belews Creek, that's operated by Duke Energy, that is
7 relatively close to the North Carolina-Virginia border.

8 Q. And I couldn't quite hear that. Did you say Belews
9 Creek?

10 A. Belews Creek.

11 Q. And how about the Dan River facility?

12 A. It could be considered very near the North
13 Carolina-Virginia border, yes.

14 Q. And emissions from these power plants along the North
15 Carolina-Virginia border can cause negative degradation of
16 air quality in the state of Virginia; is that correct?

17 A. I think it's reasonable to conclude that there is
18 some downwind into Virginia, impact from these power
19 plants, yes, sir.

20 Q. In addition to sending pollution to North Carolina --
21 excuse me -- to Virginia, North Carolina receives
22 pollution that comes from other states; is that correct?

23 A. Absolutely.

24 Q. Does wind direction have anything to do with the
25 transport of pollution?

1 **A.** I think it's a critical matter in the transport of
2 pollution.

3 **Q.** From May to September, what is the predominant wind
4 direction in the majority of North Carolina?

5 **A.** It can be said that in parts of North Carolina there
6 is a general southwesterly flow, but that would be an
7 overgeneralization. You have to look at individual parts
8 of the state to understand. Higher elevations in the
9 western part of the state experience different
10 meteorological conditions than lower elevation sites, say,
11 of the Piedmont, and in those cases the wind flow would be
12 more geostrophic with the larger wind patterns of the
13 country that are northwesterly and southwesterly.

14 **Q.** But it is true that the predominant wind direction in
15 the majority of North Carolina is from the southwest; is
16 that correct?

17 **A.** In the Piedmont, that's correct.

18 **Q.** And in the majority of North Carolina?

19 **A.** I couldn't classify it as the majority. Along the
20 coastline is drag winds, and depending on what time of the
21 year you're talking about, they can actually be
22 northeasterly. And in the North Carolina mountains there
23 is topographical features. Like here, where we sit right
24 now in Asheville, the French Broad River Valley has a lot
25 of dictation over the wind, making it more southeasterly

1 at times and northwesterly at other times.

2 Q. If I could have you look in book 7, among those many
3 books that I asked you to get.

4 A. Yes, sir.

5 Q. I apologize. You didn't actually need book 7. I
6 believe your deposition transcript is in book 8. Should
7 be Exhibit 147.

8 A. Yes, sir.

9 Q. And I'm looking at page 88, starting at line 13.

10 A. Yes, sir.

11 Q. I asked you: "Well, would you agree with the
12 statement that, in North Carolina, climatologically, the
13 predominant wind direction during the months of May to
14 August is from the southwest, as a high pressure system
15 located off the Eastern Seaboard is the dominant
16 summertime meteorological pattern for North Carolina?"

17 And you answered: "Looking at it from a
18 climatological standpoint, a view or a norm over a 30-year
19 period, yes; I would say that the predominant wind
20 direction in the majority of North Carolina is from the
21 southwest."

22 Is that correct?

23 A. That is correct.

24 Q. And does that refresh your recollection that the
25 predominant wind direction in the majority of North

1 Carolina is from the southwest during the May-to-August
2 time frame?

3 **A.** Yes, sir.

4 **Q.** And here in Asheville, for example, ozone levels in
5 the summertime have a high frequency of being higher when
6 winds blow from the direction of Atlanta; is that correct?

7 **A.** There is a correlation of frequency of higher ozone
8 in the Asheville valleys with respect to --

9 **Q.** And you just heard Mr. Appel testify about the back
10 trajectory analysis, looking at PM2.5 pollution in Catawba
11 and Davidson Counties; is that correct?

12 **A.** Yes, sir.

13 **Q.** And would you agree that a fair assessment of that
14 work is that all of the various analyses performed point
15 to North Carolina as the prevailing source region for
16 PM2.5?

17 **A.** I would think all of these analyses would point to
18 the fact that North Carolina is a significant contributor
19 to air pollution levels and air pollution issues in the
20 state.

21 **Q.** If you'll look on page 115 of your deposition
22 transcript.

23 **A.** Yes, sir.

24 **Q.** I'm looking at line 14. And we were talking about
25 that back trajectory, and I asked you -- do you see the

1 sentence, which I believe is the second sentence under 4:

2 "All of the various analyses performed point to North
3 Carolina as the prevailing source region for PM2.5. That,
4 again, was a true statement, wasn't it?"

5 And your answer was: "As a generalization in the
6 closing statements of this white paper, I think that's a
7 fair assessment of the work."

8 Do you agree with that?

9 **A.** Yes, sir.

10 **Q.** In terms of analyzing the sources of elevated ozone
11 in North Carolina, do you recall that at some time during
12 2006 the North Carolina Division of Air Quality did a
13 report about the most severe high ozone episode of the
14 year of 2005?

15 **A.** Mr. Lancaster, I'm not immediately familiar with that
16 report.

17 **Q.** Okay. And it's a copy of -- it is defendant's trial
18 Exhibit 116, which is in book 6.

19 **A.** Yes, sir.

20 **Q.** Do you recall this?

21 **A.** Yes, sir.

22 **Q.** Do you recall this report, case study, of the late
23 July, 2005, ground level ozone episode in North Carolina?

24 **MR. BERNSTEIN:** Your Honor, we're going to
25 object. This document -- Mr. Bridgers testified at his

1 deposition that he didn't write this document. This
2 document was written on a contract with the North Carolina
3 Division of Air Quality, written by a researcher at the
4 University of Maryland.

5 Like I said, Mr. Bridgers didn't write it. In
6 fact, he testified at his deposition that he never
7 actually read the entire document either. So this
8 document was produced by a third party at the University
9 of Maryland on a contract. It is actually quite similar
10 in nature to the document that this Court excluded from
11 evidence on the first day of the trial with regard to the
12 Forest Service when the state was discussing with Mr. Bill
13 Jackson a report that was done for the Forest Service and
14 which was not written by the Forest Service which was done
15 on contract. We have a very similar situation here with
16 this document, as I indicated.

17 There was some testimony at the deposition that
18 this document may have been reviewed by Mr. Nick Whitcraft
19 of the Division of Air Quality, who is also not testifying
20 in this case, who may have reviewed this document and may
21 have indicated any glaring inaccuracies with the document,
22 but there is no indication of whether those glaring
23 inaccuracies were even corrected.

24 So this document clearly is hearsay and we ask
25 that his testimony not continue with regard to this

1 document.

2 **MR. LANCASTER:** I'm quite sorry to have to point
3 out that Mr. Bernstein is incorrect. Mr. Bridgers
4 reviewed his deposition carefully and made some
5 corrections to it, and among his corrections, he stated
6 that he had mistakenly testified that Mr. Marufu,
7 M-a-r-u-f-u -- if I'm mispronouncing his name, I
8 apologize -- he was mistaken about his role. He testified
9 that, instead, Mr. Whitcraft who was an employee of the
10 North Carolina Division of Air Quality, was the primary
11 author, and during his deposition Mr. Bridgers testified
12 that he was also a co-author of this document.

13 **THE COURT:** I'll withhold ruling until after the
14 cross-examination, at which time, if you renew the motion,
15 I'll rule on it.

16 **MR. LANCASTER:** Thank you, Your Honor.

17 **Q.** (By Mr. Lancaster) As I just indicated, you are in
18 fact a co-author of this Defendant's 116; is that correct?

19 **A.** That is correct. Seeing the report in front of me --
20 I did not immediately recognize, when you asked the
21 previous question because I had a very small role in this
22 document.

23 **Q.** Was I correct in stating that Mr. Whitcraft of the
24 North Carolina Division of Air Quality did take the lead
25 in writing this report?

1 **A.** I believe, in discussions with Mr. Whitcraft after
2 the deposition, I'm recalling now that there was a mutual
3 period of documentation between he and Dr. Marufu, but the
4 specifics of the documentation I'm just not familiar with.

5 **Q.** If I could refer you to your deposition transcript,
6 at the very end of it, I believe it is Exhibit -- do you
7 have it in front of you?

8 **A.** Is that book 7?

9 **Q.** I believe that's correct. I brought so many books,
10 but I didn't bring that one. I brought the wrong books, I
11 guess.

12 **A.** All right. I apologize, Mr. Lancaster.

13 **THE COURT:** Where are we? In book 7,
14 Mr. Lancaster?

15 **MR. LANCASTER:** It should be book 7, that's
16 correct. I'm sorry. It should be book 8, Defendant's
17 Exhibit 147. I apologize.

18 **THE WITNESS:** That's okay. I was finding
19 everybody else's deposition but mine. 147. I am there.

20 **Q.** (By Mr. Lancaster) At the very end of your deposition
21 should be your correction sheets and signature.

22 **A.** Yes, sir.

23 **Q.** And page 1 of those sheets, there is a correction for
24 page 37, lines 13 through 16. Do you see that?

25 **A.** Yes, sir.

1 Q. And does it say that "Nick Whitcraft was the primary
2 author and prepared most of the document, with some
3 assistance from Lackson Marafu, who is also listed at the
4 top of the document, from the University of Maryland"?

5 A. That is part of the corrections, yes, sir.

6 Q. And after your deposition, you took the time to
7 carefully read through it and make sure everything was
8 correct, and you made that correction; is that correct?

9 A. I read through the deposition. I did not read the
10 document.

11 Q. And the first paragraph of Defendant's Exhibit 116,
12 it indicates that ozone peak in 1998 and 1999, near 70
13 exceedance days per year, with a smaller peak of 51
14 exceedances in 2002. The 2003 and 2004 years had very few
15 exceedances. Is that correct?

16 A. That is in the report, yes, sir.

17 Q. And that's true, isn't it?

18 A. From my recollection of the analysis I have done in
19 the past, yes, that would be generally true.

20 Q. In fact, in North Carolina in the year 2004, ozone
21 levels were at the lowest on record across the state,
22 weren't they?

23 A. I would classify it as lowest in modern era.

24 Q. Okay, lowest in modern era.

25 And in 2005 in North Carolina, ozone levels were

1 higher than they had been the previous two years but lower
2 than previous years with comparable weather conditions.

3 Isn't that correct?

4 **A.** I think that's a good generalization, yes, sir.

5 **Q.** And as we discussed with Mr. Appel, weather
6 conditions are important in terms of creation of ozone; is
7 that correct?

8 **A.** Absolutely.

9 **Q.** Now, in the wintertime in North Carolina, ozone
10 values are much lower than they are from May to September;
11 is that correct?

12 **A.** That's a generally true statement, yes, sir.

13 **Q.** And I believe you testified in your deposition that
14 during the wintertime in North Carolina, ozone levels
15 generally don't rise above code green range. Do you
16 recall that?

17 **A.** In the previous definition of the AQI for ozone under
18 the .08 standard, that would be absolutely correct, yes,
19 sir.

20 **Q.** What does code green mean?

21 **A.** The green classification as defined by the air
22 quality index, that's an EPA terminology, code green would
23 be good air quality and generally does not have health
24 impacts on the general population.

25 **Q.** And in fact, from the end of October through the

1 beginning of April, many of North Carolina's monitors that
2 measure ozone levels in the air are not even operated, are
3 they?

4 **A.** The requirements -- and I'm not an expert in the
5 monitoring field, but the requirements by EPA is that
6 North Carolina monitors, under the old standard, .08
7 standard, for ozone at the April 1st through October 31st
8 time frame.

9 **Q.** And this study that was done, Defendant's Exhibit
10 No. 116, it studied the most severe high ozone episode in
11 2005 that occurred from July 25 to July 28. Is that
12 correct?

13 **A.** It was the most severe in the respects of being the
14 highest ozone reported for the summer.

15 **Q.** In late July, which is what it happens to be right
16 now, is the typical time when you would see your worst
17 ozone events in North Carolina; is that right?

18 **A.** The peak, if you would like to refer to it as that,
19 of our air quality ozone season typically runs anywhere
20 from June through August, but mid July is a better
21 approximation for the center of that peak period.

22 **Q.** And in Defendant's Exhibit 116, the case study of the
23 July 2005 event, the conclusion that the North Carolina
24 Division of Air Quality reached was that local impacts,
25 meaning the western Piedmont, including Charlotte and

1 upstate South Carolina, were greater than regional impacts
2 in causing this particular severe high ozone episode. Is
3 that correct?

4 **A.** In this unique event, that is correct, yes, sir.

5 **Q.** And this document also makes reference to something
6 called the Charlotte ozone plume. Is that correct?

7 If I could turn your attention in Defendant's Exhibit
8 117, page 9.

9 **A.** Thank you.

10 **Q.** Near the end of the second paragraph.

11 **A.** It does.

12 **Q.** And it states: "In the past, the Charlotte ozone
13 plume has played a role in many of the exceedance studies
14 in the triad, Hickory, and the mountains. Is that
15 correct?

16 **A.** This report does say that, yes, sir.

17 **Q.** And you agree, don't you, sir, that the Charlotte
18 ozone plume has played a role in some degree for many of
19 the ozone exceedance days in the triad, Hickory, and here
20 in the mountains, correct?

21 **A.** The Charlotte ozone plume does play a significant
22 role in exceedance days in the triad, to a lesser degree
23 in Hickory, and to a lesser degree in the mountains. But
24 in all three cases, there is, on occasion, some impact
25 from Charlotte in these areas.

1 Q. If I could refer you to your deposition transcript
2 again. And I'll try to get it right this time. It's
3 Exhibit 147 in book number 8.

4 A. I have it.

5 Q. And on page 41.

6 A. Yes, sir.

7 Q. Line 12.

8 A. Yes, sir.

9 Q. I had asked you to repeat your answer, and you
10 stated:

11 "I'll repeat it again. I was saying that I would
12 agree with the statement that the Charlotte ozone plume
13 has played a role in some to many of the exceedance days
14 in the triad, Hickory, and the mountains, but it's not
15 played a role in all the exceedances in the triad,
16 Hickory, and the mountains."

17 Is that correct?

18 A. Yes, sir.

19 Q. So you do agree that the Charlotte ozone plume plays
20 a role in many of the exceedance days for ozone in triad,
21 Hickory, and the mountains.

22 A. I think in my previous answer, I believe it plays a
23 significant role on many days in the triad, to a lesser
24 degree in the Hickory area, to a lesser degree in the
25 mountains. So in this answer, it plays a role between

1 some and many. It just depends on the year and depends a
2 lot on the climatological wind flow.

3 Q. In North Carolina, there is a climatological or
4 meteorological feature called a lee trough. Isn't that
5 correct?

6 A. Yes, sir.

7 Q. And does that result both from the mountains being in
8 the western part of the state and from various soil
9 types -- excuse me -- varying soil types across the
10 eastern part of the state?

11 A. It is a result of westerly flow over the mountains
12 into the Piedmont in North Carolina. And in North
13 Carolina's case, there is differential heating of the
14 different soil types between the Sand Hills and the
15 Piedmont that can also form a trough that commonly is
16 referred to as a lee trough, although that's incorrect.
17 It's formed from differential heating. It's not
18 technically a lee trough, but it looks the same and feels
19 the same.

20 MR. LANCASTER: Ms. Shea, if I could ask you to
21 put Defendant's Exhibit 8 on the monitor. And it's in
22 book No. 1.

23 Q. (By Mr. Lancaster) And does Defendant's Exhibit 8
24 represent an estimation that you drew at your deposition
25 of the approximate location of this lee trough?

1 **A.** It represents a presentation I gave at my deposition
2 of the general range of where the trough could be located,
3 yes, sir.

4 **Q.** And the lee trough is between the two red lines; is
5 that correct?

6 **A.** When typically found, it would lie somewhere between
7 those two lines.

8 **Q.** And a number of North Carolina's power plants lie
9 within the area of this lee trough; is that correct?

10 **A.** There is a large majority of our EGUs that would be
11 between the two red lines that I drew, yes, sir.

12 **Q.** And one effect of this lee trough is to potentially
13 congregate pollutants into one location; isn't that
14 correct?

15 **A.** The lee trough can aggravate pollutants. It doesn't
16 discriminate between local or regional transferred
17 pollutants. But it can congregate or aggravate
18 pollutants, yes, sir.

19 **Q.** And the last thing I want to ask you about is the
20 recent PM2.5 attainment designation that North Carolina
21 has prepared. Are you familiar with that?

22 **A.** Yes, sir.

23 **Q.** In fact, you're probably very familiar with that,
24 aren't you?

25 **A.** It's part of life at work, yes, sir.

1 **Q.** I guessed that because the web site said to contact
2 you with questions.

3 A copy of it is TVA Exhibit 101, which is in book
4 No. 5.

5 **A.** I have it now.

6 **Q.** And is Exhibit 101 a document entitled "Pre-Hearing
7 Draft: The North Carolina Fine Particulate Matter
8 Attainment Demonstration for the Hickory and
9 Greensboro-Winston-Salem-High Point Fine Particulate
10 Matter Nonattainment Areas (Catawba, Davidson, and
11 Guilford Counties."

12 **A.** Yes, sir.

13 **Q.** And these are the three counties that have been
14 designated by EPA as not attaining the annual PM2.5
15 standard of 15 micrograms per cubic meter?

16 **A.** The Catawba, Davidson, and Guilford Counties are the
17 three counties that are currently in nonattainment as
18 defined by EPA for the annual standard, yes, sir.

19 **Q.** And all three of those counties are now expected to
20 come back into attainment of that standard by no later
21 than April of 2010; is that correct?

22 **A.** Based on the modeling that was done in this setting,
23 yes, sir.

24 **Q.** If I could ask you to look at page 12 of Exhibit 101.

25 **A.** I have it, sir.

1 **Q.** The first paragraph of page 12, about five or six
2 lines down, indicates, "The PM2.5 implementation rule
3 allows states to exempt NOx by demonstrating that NOx
4 emissions are not a significant contributor to an area's
5 PM2.5 nonattainment problem." Is that correct?

6 **A.** It does state that, yes, sir.

7 **Q.** And did the North Carolina Division of Air Quality
8 perform a number of sensitivity runs that showed that NOx
9 was not a significant contributor to these counties' PM2.5
10 nonattainment problems?

11 **A.** We did a number of sensitivities to look at the
12 insignificance of NOx in the state of North Carolina.
13 There is an ongoing discussion with USEPA on whether or
14 not that meets the level of insignificance. In light of
15 the recent vacatur of the CAIR rule, there is a lot of
16 question of what the level of significance is.

17 **MR. LANCASTER:** Your Honor, may I approach the
18 flip chart?

19 **THE COURT:** Yes.

20 **MR. LANCASTER:** No one has had very good luck
21 with this flip chart yet, but I'm going to try it.

22 **Q.** (By Mr. Lancaster) On page 13 of Defendant's Exhibit
23 101, does that display the summary of these sensitivity
24 runs?

25 **A.** It does, yes, sir.

1 Q. And one of the runs was -- took away a hundred
2 percent of the NOx emissions; is that correct?

3 A. That was a hundred percent of all NOx emissions.

4 Q. Right. A very unrealistic scenario; is that correct?

5 A. Completely unrealistic.

6 Q. And for Catawba County, did taking all 100 percent of
7 the NOx emissions result in lowering the PM2.5
8 concentrations by .79 micrograms per cubic meter?

9 A. If my math on the stand is correct, that is, yes,
10 sir.

11 Q. I think we got the same thing. I picked that one
12 because it had a round number at the end.

13 So for Catawba County, 0.79 micrograms per cubic
14 meter was the improvement with 100 percent of the NOx
15 emissions eliminated; is that correct?

16 **MR. BERNSTEIN:** Your Honor, may I go to a
17 location where I can see that writing more clearly?

18 **THE COURT:** Yes.

19 **THE WITNESS:** I'm sorry, Mr. Lancaster?

20 **BY MR. LANCASTER:**

21 Q. The 0.79 micrograms per cubic meter improvement in
22 PM2.5 levels correlates with the 100 percent NOx reduction
23 run; is that correct?

24 A. 100 percent NOx reductions in North Carolina, yes,
25 sir.

1 Q. And then, also, for Catawba County, there was a
2 30 percent NOx reduction run; is that correct?

3 A. That is correct.

4 Q. And did that result in an improvement in PM2.5 levels
5 of approximately 0.09 micrograms per cubic meter?

6 A. .09, yes, sir.

7 Q. That one was the easy one to calculate.

8 So 0.09 was the improvement if there was a 30 percent
9 reduction; is that correct?

10 A. In the modeling for all NOx emissions reductions in
11 North Carolina, yes, sir.

12 Q. And would it be fair to call that, just as an
13 approximation, 0.1?

14 A. If we're rounding, yes, sir.

15 Q. Okay. If you would -- with these numbers in mind, if
16 you would turn to page 15, the last paragraph.

17 A. Yes, sir.

18 Q. It states: "From these modeling sensitivities, it is
19 demonstrated that NOx is clearly insignificant to the
20 total PM2.5 mass in the nonattainment areas. "

21 Is that correct?

22 A. It is summarized so, yes, sir.

23 Q. And then it says: "Unrealistically severe reductions
24 in NOx emissions, 100 percent NOx emissions reductions,
25 resulted in comparatively minor reductions in total PM2.5

1 mass."

2 Is that correct?

3 A. It does state that, yes, sir.

4 Q. So, does "comparatively minor reductions" correspond
5 to the 0.79 number?

6 A. Yes, sir.

7 Q. It goes on to say, of course, that such severe
8 reductions cause detrimental impacts on processes involved
9 in model chemistry.

10 And then it goes on to say: "The most realistic
11 scenario, 30 percent NOx emission reductions, generated
12 minuscule decreases in total annual PM2.5 mass."

13 Is that correct?

14 A. The document's summarized in that way, yes, sir.

15 Q. And does the phrase "minuscule decreases" correspond
16 with the approximately 0.1 micrograms per cubic meter
17 figure?

18 A. It does in this case.

19 Q. And it summarizes: "Resulting benefits from such a
20 reduction were less than 0.1 micrograms per cubic meter,
21 or less than 1 percent of the annual PM2.5 NAAQS; coupled
22 with the aforementioned emissions data, observational data
23 and attainment testing found in Appendix O, the modeling
24 sensitivities reinforced the North Carolina Division of
25 Air Quality's finding that NOx, as a precursor to PM2.5

1 concentrations, is insignificant."

2 Is that correct?

3 A. That is North Carolina Division of Air Quality's
4 assertion. Unfortunately, EPA, so far, has not seen that
5 to be in their case.

6 Q. So EPA has not yet agreed, but North Carolina's
7 position is that these numbers are insignificant?

8 A. North Carolina was basing their modeling and these
9 results on what we saw as more realistic controls at
10 30 percent. But all of the EPA policy that's been set,
11 including the now vacated CAIR rule, was set using 100
12 percent modeling. And so where we've said "comparatively
13 minor reductions," EPA would argue that that's not
14 insignificant.

15 Q. Is EPA arguing that the 0.1 figure is not
16 insignificant?

17 A. If one were looking at interstate versus intrastate
18 transport, 0.1 micrograms is not significant to interstate
19 transport.

20 MR. LANCASTER: Thank you.

21 Your Honor, I have marked the flip chart as
22 Defendant's Exhibit 541, and I would move for the
23 admission of Defendant's Exhibits 8, 101, 116, and 541.

24 MR. BERNSTEIN: Your Honor, we object to the
25 admission of the flip chart. It's really the defendant's

1 notes about what the witness said. The defendant's
2 testimony -- the witness's testimony speaks for itself.

3 **MR. LANCASTER:** And 541 would be for
4 illustrative purposes.

5 **THE COURT:** All right. I'll let Defendant's 541
6 in for illustrative purposes.

7 **MR. LANCASTER:** And the others, Your Honor, were
8 8, 101, and 116.

9 **MR. BERNSTEIN:** And we'd also object, in a
10 similar vein, to our objection previously with regard to
11 the study by the University of Maryland. I do not recall
12 the number.

13 116, Your Honor.

14 **THE COURT:** I've admitted 541. Now 8, 101, and
15 115, what's the objection to each one of those?

16 **MR. LANCASTER:** Pardon me, Your Honor. Let me
17 start those over. It's 8, 101, and 116. And
18 Mr. Bernstein's objection to 116 is the one we discussed
19 earlier, and Mr. Bridgers has now testified that a North
20 Carolina Division of Air Quality official was the primary
21 author.

22 **THE COURT:** All right. I said I would wait
23 until cross-examination on 115. Is that the one?

24 **MR. BERNSTEIN:** I believe it was 116.

25 **MR. LANCASTER:** I'm sorry, I wasn't clear. 116

1 | is the one in issue.

2 **THE COURT:** All right. Go ahead with the cross,
3 and I'll -- had you finished with this witness?

4 **MR. LANCASTER:** Yes, sir. I have no further
5 questions.

6 THE COURT: All right.

7 **MR. BERNSTEIN:** If I could have a moment, I'd
8 like to review an exhibit before I get started with
9 Mr. Bridgers.

11 **THE WITNESS:** Your Honor, if I may, could I
12 refill my water glass?

13 **THE COURT:** Yes. Someone give the witness some
14 water here.

CROSS EXAMINATION

16 BY MR. BERNSTEIN:

17 Q. Mr. Bridgers, I'd like to start off by talking about
18 the lee trough that Mr. Lancaster discussed with you.

19 A. Yes, sir.

20 Q. Would you describe again for the Court how the lee
21 trough affects the movement of pollutants in the area of
22 the trough

23 A. I'm sorry. There was some coughing. Could you
24 repeat the question?

25 Q. Could you describe for the Court again how the lee-

1 trough affects the movement of pollutants in the area of
2 the trough.

3 **A.** The trough, in itself, is an area of low pressure at
4 the surface, and air generally moves inward toward low
5 pressure, and then there is a rising motion in that area.
6 And so the fact that the air is moving inward at the
7 surface into itself transports pollutants into one
8 location. The air then rises depending on the magnitude
9 of a more dominant high pressure system that would cap any
10 upward daytime mixing. Then, if the mixing, in fact, is
11 capped so that that mixing doesn't vent out of what we
12 call the mixed layer, then in that region, there would be
13 a concentration, an aggregation of air pollutants.

14 But in the mixing itself, it can aggregate both
15 locally emitted pollution and also pollution that would
16 come in on transport winds in mid levels of the
17 atmosphere.

18 **Q.** And so if I understand you correctly, you're saying
19 that the lee trough would tend to aggregate the pollutants
20 in this area, and those pollutants can be locally
21 generated and result from regional transport from other
22 states; is that correct?

23 **A.** The trough does not discriminate against pollutants,
24 no, sir.

25 **Q.** So if pollutants were to arrive at the lee trough

1 from the west, they can get trapped in the lee trough and
2 contribute to elevated ozone levels there?

3 A. That's a fair statement.

4 Q. Mr. Lancaster showed you an exhibit that you drew at
5 your deposition which seemed to indicate the location of
6 the lee trough. It is Defendant's Exhibit No. -- I think
7 it was 8. 48. Trial Exhibit No. 8. And you can see it
8 there on the screen.

9 A. Yes, sir.

10 Q. With regard to the location of the lee trough, is the
11 lee trough always comprising that entire area that you
12 drew?

13 A. No, sir. It's generally more focused.

14 The lines that I drew on this map are just a more
15 typical range that we would expect to see the lee
16 trough -- or the trough, as we're calling it.

17 Q. So when the trough is there, is it a static
18 phenomenon?

19 A. Absolutely not. It moves with time, east and west.

20 Q. So it does not fill up this entire area; is that
21 correct?

22 A. It does not.

23 Q. Is this area of the state called the Piedmont?

24 A. Generally, yes, sir.

25 Q. Have you observed high ozone days in the Piedmont

1 area when the trough does not exist?

2 A. Yes, sir.

3 Q. And when the trough does exist, are there areas in
4 the Piedmont that are outside the trough that experience
5 high ozone days?

6 A. Absolutely.

7 Q. Mr. Bridgers, do you routinely review ozone
8 monitoring data from around the state as necessary for
9 your duties?

10 A. It is a critical aspect of my job, yes, sir.

11 Q. And have you reviewed data for 2007 for the Charlotte
12 area?

13 A. Absolutely, yes, sir.

14 **MR. BERNSTEIN:** Your Honor, may I approach?

15 **THE COURT:** Yes, sir.

16 Q. (By Mr. Bernstein) Mr. Bridgers, is this the type of
17 data that you're familiar with?

18 A. Yes, sir.

19 Q. And does this appear to be actual data from these
20 monitors from 2007?

21 A. Yes, sir.

22 Q. And there are two monitors that are described in this
23 exhibit; is that correct?

24 A. There are two monitors, yes, sir.

25 Q. Would you please tell the Court where these monitors

1 are located?

2 A. The Garinger monitor is in the center of the
3 Charlotte city, and the Rockwell monitor could be
4 considered in the suburbs of the Charlotte metropolitan
5 area.

6 Q. So with regard to this data, in August of 2007, can
7 you please tell the Court how many days in the Charlotte
8 area were in code yellow on the air quality index or
9 worse?

10 A. All 31 days of August.

11 Q. So every single day in August?

12 A. Yes, sir.

13 Q. Is it your experience that the lee trough remains in
14 this area for such a stretch of time?

15 A. It does not remain stationary or present for months
16 at a time, no, sir.

17 Q. I may have failed in my duties here. This exhibit is
18 Exhibit 530; is that correct?

19 A. It says Plaintiff's Exhibit 530.

20 Q. Okay. Thank you.

21 Now, are you familiar with meteorological conditions
22 in other areas of the country that affect pollution
23 conditions?

24 A. Yes, sir.

25 Q. And have you found that other areas also have

1 meteorological factors that contribute to elevated
2 pollutant levels?

3 **A.** Yes, sir.

4 **Q.** Are you familiar with conditions in the Denver area?

5 **A.** I am, sir.

6 **Q.** Can you describe for the Court how meteorological
7 conditions in that area affect pollutant levels?

8 **A.** Denver, as other parts of the country, has a variety
9 of meteorological factors that impact their air quality.
10 They also are in the lee of the rocky mountains, so they
11 also experience a lee trough phenomenon that affects their
12 ozone concentrations in the summertime. And they also are
13 in a diverse region of meteorology that is characterized
14 by significant winter nocturnal inversions. That helps to
15 trap emissions from various sources, but it increases
16 their particle pollution levels, or PM2.5 levels.

17 **Q.** Are you familiar with conditions in the Houston area?

18 **A.** Yes, sir, I am.

19 **Q.** Can you describe how conditions in the Houston area
20 tend to exacerbate the pollution conditions.

21 **A.** In Houston, there is a large petrochemical refinery
22 conglomeration that's in proximity to their shipping
23 channel. Houston, along with most major cities that are
24 on a large body of water, experiences in this case a gulf
25 breeze, commonly referred to as a sea breeze. That

1 phenomenon helps to concentrate their precursor pollutants
2 in their ozone concentrations over the city and areas
3 inland from those petrochemical refineries.

4 Q. Are you familiar with conditions in the LA basin
5 area?

6 A. Yes, sir.

7 Q. Can you describe for -- can you describe for the
8 Court the meteorological conditions in the LA basin area
9 that tend to affect pollution conditions there?

10 A. LA, without question, is a large area of population
11 and industry. They are bordered to the west by a rather
12 cold or chilly Pacific Ocean that has a very stable marine
13 boundary layer. To the east of the LA basin, there's
14 topographical rather high mountains and a very stable
15 marine layer and a physical boundary to the west to trap
16 the pollution in the LA basin.

17 Q. So, in your experience, Mr. Bridgers, is North
18 Carolina unique in having meteorological topographic
19 conditions that tend to have an influence on pollution
20 levels?

21 A. In my experience, every location in the country that
22 I'm aware of that has elevated ozone or particulate levels
23 has some qualifying or identifying unique meteorological
24 phenomenon that is their area's, if you want to say, worst
25 enemy, but it's that feature that exacerbates the

1 pollution in those areas. But there's always a unique
2 feature that's been identified in every case.

3 So North Carolina is not unique in the fact that it
4 has a unique meteorological situation.

5 Q. And all those areas are required to attain the
6 National Ambient Air Quality Standards just the same,
7 correct?

8 A. Yes, sir.

9 Q. And the pollution in that area, simply by the fact
10 that it is caused by meteorological conditions, or
11 exacerbated by meteorological conditions, is not any less
12 dangerous to human health or the environment, is it?

13 A. No, sir.

14 Q. Now let's talk about North Carolina again, for a
15 second.

16 So it was your testimony that the lee trough tends to
17 exacerbate ozone concentrations, but pollution can come
18 from other places into the lee trough?

19 A. Yes, sir.

20 Q. As part of your duties with the Division of Air
21 Quality, have you investigated to assess meteorological
22 conditions that contribute to elevated ozone levels in the
23 western North Carolina area?

24 A. Yes, sir, absolutely.

25 Q. And what tools have you used to conduct those

1 investigations?

2 A. We have used, as a part of the state planning
3 process, or the SIP process, we have used photochemical
4 models, such as the CMAQ model, which has been discussed
5 in this case before.

6 We've used high-split trajectory modeling, which
7 Mr. Appel spoke to in his testimony earlier. We have also
8 used observational analysis through our daily air quality
9 forecasting process over the last nine years here in the
10 Asheville region to examine the air quality situation in
11 this region.

12 Q. And through those investigations, what did you find
13 with regard to elevated ozone levels in the western part
14 of North Carolina?

15 A. An important aspect of the pollution levels at the
16 elevated monitoring sites in western North Carolina is
17 that, on a very frequent basis, the ozone levels are at
18 their highest in the middle of the night, occurring
19 somewhere, say, between 11:00 and 2:00 a.m., sometimes all
20 the way up to sunrise.

21 As we spoke about earlier today in testimony, ozone
22 is a photolytic or photochemical reaction. So in the case
23 that we have ozone present in the overnight period, it was
24 not formed at that time.

25 When we investigate air pollution in regions

1 surrounding the North Carolina mountains, in the 6 to
2 12-hour period prior to this higher ozone being observed
3 at the overnight period of these ridge-top monitors, we do
4 see a very high frequency of ozone, if not exceeding,
5 exceeding the National Ambient Air Quality Standards,
6 whether it's the older .08 parts per million standard or
7 the newer .075 parts per million standard.

8 We observe that most frequently having -- we observe
9 these higher ozone concentrations in areas such as
10 Knoxville, Chattanooga, north Georgia, central Georgia,
11 Alabama, having impacts in those areas, and the winds blow
12 from that direction at the mid levels of the atmosphere at
13 the same level as these high elevation monitors. And like
14 I said, these higher elevations are observed at a 6 to
15 12-hour lag period ahead of when we see it at the
16 ridge-top monitors.

17 Q. So is it the view of the North Carolina Division of
18 Air Quality that these high ozone levels in the morning
19 hours in western North Carolina at the ridge tops are
20 directly correlated to high ozone events on a previous day
21 in, for example, Knoxville, Chattanooga, and northern
22 Alabama areas?

23 A. We would draw that conclusion, yes, sir.

24 Q. Now, are there any monitors in the western North
25 Carolina mountains that are not retaining the current

1 ozone standard?

2 A. At present time, we have all four of our monitors
3 that are at the ridge tops, based on the last full three
4 years of data, 2005 through 2007 -- this data has been
5 quality assured -- that all three sites currently violate
6 the .075 parts per million standard, revised ozone
7 standard; and based on the preliminary data through
8 July 24th of this year, the 2006 through 2008 ozone
9 data -- again, the 2008 data will not have been quality
10 assured yet -- but all indications are that they are
11 continuing to violate the National Ambient Air Quality
12 Standard of .075 parts per million at these four ridge-top
13 mountain sites.

14 Q. So let me see if I understand this.

15 With regard to the 2008 data, are you saying that
16 even if all the remaining days of 2008 are below the
17 standard in those areas, they're still violating the
18 standard at least for this year?

19 A. If the monitoring data passes all of the quality
20 assurance tests, which I don't have reference of a period
21 where we haven't passed these tests in the past, the
22 remainder of the year, if it had zero ozone, in the 98th
23 percentile for these four monitoring sites, would have a
24 three-year design value, as it was, would be above the
25 National Ambient Air Quality Standards.

1 Q. So does the Division of Air Quality operate ozone
2 monitors in the valleys in western North Carolina and the
3 ridge tops?

4 A. We do. We have three valley sites that we normally
5 refer to as in the Asheville, quote, unquote, region.

6 Q. And which of these -- as between the valley sites and
7 the ridge-top sites, can you indicate again which of these
8 monitors are violating the standard?

9 A. Based on the 2005 to 2007 data again, being it's the
10 last fully quality-assured data, all three of these valley
11 sites are currently attaining both the older .08 parts per
12 million standard and the new .075 parts per million
13 standard, while, we spoke before, all four of the
14 ridge-top sites do violate, looking at the 2006 through
15 the preliminary 2008 data.

16 Albeit things can change for the remainder of the
17 year, these three valley sites are currently in
18 attainment, preliminarily, based on the data so far this
19 year.

20 Q. Thank you.

21 So does the Division of Air Quality have any
22 explanation for why all of the ridge-top monitors are
23 violating the standard, yet all the valley monitors are
24 attaining the standard?

25 A. That goes back to the transport issue. We see these

1 ozone concentrations rise at night when the winds are
2 commonly westerly or southwesterly, but during the day,
3 when there is local production of ozone, it doesn't occur,
4 so the valley sites aren't seeing local production, so
5 they're not violating, where the ridge-top sites, where
6 there aren't very many emissions and ozone is being
7 observed in the middle of the night, is a transport issue.

8 Q. Do you provide air quality forecasts for western
9 North Carolina?

10 A. I do, sir.

11 Q. And do you provide just a single forecast for the
12 area, or is it a specific forecast for the valleys and a
13 separate forecast for the ridge tops?

14 A. When I first started working for the state as a
15 meteorologist, in that capacity, in 1999, we were just
16 beginning air quality forecasting in the Asheville region.

17 Our very first attempt at forecasting air quality
18 here was a region-wide, one forecast, where we were
19 looking at both ridge-top and valley monitors. This is on
20 record, but the performance was not very good. We were
21 dissatisfied at the end of that summer that we weren't
22 accurately giving the right information, passing the right
23 warning message along to the general population in the
24 Asheville region, and so it was decided in 2000 that we
25 would split the Asheville forecast region into a ridge-top

1 forecast zone and valley forecast zone, and that's because
2 of the aforementioned transport issue, as we've identified
3 it, aloft and a limited local protection issue in the
4 valleys.

5 Q. Mr. Bridgers, do you have a name that you use for the
6 monitors that are in the far west end of the state?

7 A. I commonly refer to those ridge-top monitors as the
8 sentinel monitors.

9 Q. And why do you use that name for those monitors?

10 A. To me, these sentinel monitors, as I call them, are
11 the canaries, so to speak, in the coal mine; that when we
12 are entering into a multi-day regional air quality event
13 where there is poor air quality throughout the Southeast,
14 commonly, not all of the time, but commonly, we will see a
15 reflection of higher ozone concentrations first at these
16 ridge-top monitors, and then we'll see a reflection of
17 that in the following days east of the mountains.

18 So, to me, it's the sentinel -- it's the singing
19 canary that says, okay, now we have a regional event and I
20 must be aware that we're in the middle of this air quality
21 episode.

22 Q. Mr. Bridgers, when during the year is ozone and
23 particulate matter generally more prevalent?

24 A. With regards to ozone, we've already spoke about the
25 fact that we do peak in North Carolina in the June to

1 August time frame, with mid July to early August being
2 probably the peak of the season, and that's true across
3 the entire state.

4 Fine particles are a slightly different story. On an
5 average basis, they are the highest in what we consider
6 the third quarter. PM2.5 data is looked at quarterly,
7 generally. But the June, July, and August time frame also
8 well corresponds with that period. The third quarter
9 would also include September. That's when we, on average,
10 see the highest PM2.5 concentrations.

11 But the caveat that I would put here is that fine
12 particle concentrations can be heavily influenced by
13 forest fires or when we have large natural disasters and
14 there's a lot of burning that may occur afterwards, say we
15 have a hurricane or large winter storm with a lot of
16 debris that local governments would then allow open
17 burning. But those are the exceptions.

18 Q. With regard to the ozone, can you describe for the
19 Court the wind patterns with regard to the upper
20 elevations during that period that might affect the ridge
21 tops in western North Carolina?

22 A. As already has been discussed in this case, there is
23 a presence of a Bermuda high. That pressure system is a
24 dominating factor throughout the Southeast and, for that
25 matter, the western Atlantic, south of Bermuda during the

1 summertime.

2 It is typically the case that at the mid levels of
3 the atmosphere that there is a clockwise flow of air into
4 the Southeast. That generally results in a west to
5 west-southwesterly flow into portions of northern North
6 Carolina -- when I say northern, northwestern North
7 Carolina -- and it becomes more southwesterly as you get
8 into the southern reaches of North Carolina, say, out
9 toward Wilmington.

10 The caveat would be that the northern extent of the
11 jet stream, which is normally at this time of the year up
12 across the northern tier states near Canada, there can be
13 exacerbations, troughs that do occur with this jet stream.
14 When that does occur, it tends to flatten out this larger
15 Bermuda high system, and the flow becomes more westerly
16 into North Carolina.

17 Q. Mr. Bridgers, are you familiar with SAMI?

18 A. I am, sir.

19 Q. Are you familiar with Clean Air Interstate Rule
20 modeling?

21 A. I am, sir.

22 Q. Are you familiar with VISTAS modeling?

23 A. Yes, I am, sir.

24 MR. LANCASTER: Your Honor, I object to this as
25 beyond the scope of direct. Mr. Bridgers is an employee

1 of the Division of Air Quality. He was disclosed as a
2 potential witness by the plaintiff in the case, early in
3 the case. He was not placed on the defendant's trial
4 witness list either as an expect-to-call witness or as a
5 may-call witness. That's why we've had to call him in our
6 case, to provide the information we wanted to obtain from
7 him. Because plaintiff could have called Mr. Bridgers in
8 its own case but chose not to, I would ask that plaintiff
9 not be allowed to cross-examine him beyond the scope of
10 direct.

11 **THE COURT:** Overruled.

12 **MR. BERNSTEIN:** Thank you, Your Honor.

13 **Q.** (By Mr. Bernstein) To pick up where we left off,
14 Mr. Bridgers, are you familiar with SAMI, Clean Air
15 Interstate Rule, and VISTAS modeling?

16 **A.** All three, yes, sir.

17 **Q.** Are your investigations and conclusions with regard
18 to the movement of pollutants in North Carolina consistent
19 with those efforts?

20 **A.** In all three cases, yes, sir --

21 **Q.** I'd like to talk to you about the University of
22 Maryland study, which is Defendant's Exhibit 116.

23 **THE COURT:** I think we'll take our mid morning
24 break and then continue. I didn't realize this would go
25 this long. We'll take a mid morning break, 15 minutes.

1 **THE WITNESS:** Thank you, sir.

2 **(Recess.)**

3 **THE COURT:** All right. You may proceed,
4 Mr. Bernstein.

5 **MR. BERNSTEIN:** Thank you, Your Honor.

6 **Q.** (By Mr. Bernstein) Mr. Bridgers, when we left off, I
7 was directing your attention to the University of Maryland
8 study, but I think I want to just cover some other
9 material first.

10 Mr. Lancaster discussed with you the Roxboro, Mayo,
11 Belews Creek, and Dan River plants. Do you recall that?

12 **A.** Yes, sir, I do.

13 **Q.** And are you aware that under the Clean Smokestacks
14 plans for these facilities, the Roxboro plant will be
15 fully scrubbed and have SCRs on all units?

16 **A.** I'm aware of system-wide caps on the various
17 pollutants, but the specific control technology at the
18 various plants, without looking at their -- without
19 looking at the yearly plan update reports, I cannot say.

20 **Q.** So, Mr. Bridgers, if I were to show you a yearly plan
21 update, that would refresh your recollection of what their
22 plans are?

23 **A.** Yes, sir.

24 **MR. BERNSTEIN:** Your Honor, would it be all
25 right if Mr. Gulick was to retrieve plaintiff's exhibit

1 book 1 for the witness?

2 **THE COURT:** All right.

3 **MR. BERNSTEIN:** And, Gary, if you could pull up
4 Exhibit 10.

5 And, Gary, if it's possible, if you could find
6 attachment A, page 11 of 15.

7 **Q.** (By Mr. Bernstein) And, Mr. Bridgers, if you would
8 turn in that document, Exhibit 10, to attachment A, page
9 11 of 15.

10 **A.** I have that open, sir.

11 **Q.** Now, with regard to Belews Creek, which is identified
12 on this page, does this refresh your recollection with
13 regard to the NOx controls that are to be placed on Belews
14 Creek?

15 **A.** Yes, sir, it does.

16 **Q.** And what are those controls?

17 **A.** Based on this plan update that was published in 2008,
18 Belews Creek, on units 1 and 2, had SCR installed in the
19 2003 to 2004 time frame.

20 **Q.** If you would go to the next page, Mr. Bridgers.

21 Does it show on this page that Belews Creek 1 and 2,
22 which are the two units at Belews Creek, scrubbed those
23 units beginning in the year 2008?

24 **A.** To level .15, yes, sir.

25 **Q.** Okay. If you would now turn in that exhibit to

1 attachment B, page 15 of 19.

2 A. I am there.

3 Q. And does it indicate on that page that the Mayo plant
4 will install or has installed a selective catalytic
5 reduction device?

6 A. It would indicate that, sir.

7 Q. And with regard to Roxboro units 1 through 4, which
8 are the only units at Roxboro, does it similarly indicate
9 all four of those units are controlled with a catalytic
10 reduction device for NOx control?

11 A. This would indicate that, yes, sir.

12 Q. On the next page, does it not indicate that the Mayo
13 unit 1, which is the only unit listed for Mayo, has a
14 scrubber scheduled for 2009?

15 A. This plan update attachment would indicate that, yes,
16 sir.

17 Q. And with regard to the four Roxboro units, does it
18 not indicate that those four units are all scheduled to be
19 scrubbed in 2007 and 2008?

20 A. Again, the plan update for this 2008 year would
21 indicate that, yes, sir.

22 Q. Now, with regard to the Dan River plant -- if you
23 would turn back, sir, to attachment A, page 11 of 15.

24 A. Yes, sir.

25 Q. Does it indicate in the columns with regard to the

1 tons of NOx emitted from those plants that those numbers
2 for Dan River appear to be very low compared to the other
3 numbers on the chart? Or fairly low.

4 A. In some cases, they're equivalent to some of the
5 emissions by some of the Duke facilities, but they're
6 significantly less than some other facilities, such as
7 Allen.

8 Q. Is it your understanding, Mr. Bridgers, that the Dan
9 River plant is a fairly small facility?

10 A. Based on my experience with the state, it's always
11 been referred to as one of the smaller plants within the
12 Duke system, yes, sir.

13 Q. Thank you.

14 Now, Mr. Lancaster talked to you about ozone levels
15 in 2003 and 2004. And there were a reduced number of
16 exceedances during those years; is that correct?

17 A. Yes, sir.

18 Q. Did meteorology play a factor in the lower ozone
19 level for those years?

20 A. Absolutely, yes.

21 Q. Can you describe that meteorology and how it played a
22 factor?

23 A. 2004, in particular, was one of the wetter years on
24 record -- and when I say "modern era," I referred to
25 earlier, I'm talking about the last 20 years -- such that

1 we had a pattern that we were regularly seeing afternoon
2 thunderstorms throughout the summer. The heavier
3 convection resulted in regular precipitation patterns.

4 In those cases, the lack of cloud-free or fully sunny
5 days, in combination with a well-mixed atmosphere of
6 constantly seeing afternoon thunderstorms, abated a lot of
7 the ozone production, and, also, it helped from the
8 deposition standpoint of view, to keep within two and a
9 half levels lower than we would commonly see in a typical
10 summer.

11 Q. Did that situation change in 2005?

12 A. It did, sir.

13 Q. Can you describe that change?

14 A. Although we are now in -- coming out of, in some
15 respects, still in it in this part of the state -- a
16 significant drought, 2005 was also a year known for
17 drought conditions in North Carolina, and that is
18 signified by lots of days with sunny skies and the lack of
19 precipitation.

20 In that case, you would just increase the potential
21 that you have abundant sunshine available for ozone
22 formation and the lack of significant mixing in the
23 atmosphere that would be associated with a convective or a
24 thunderstorm environment.

25 Q. And moving forward now to 2007, did ozone conditions

1 get even worse in 2007?

2 **A.** We had a very active summer in North Carolina with
3 regards to higher ozone concentrations, and we believe
4 that's a direct correlation with the fact that we had a
5 significant drought in this part of the country.

6 **Q.** And we had a significant drought back in 1998 to
7 2002; is that correct?

8 **A.** Of the modern era I spoke of, say, in the last 20
9 years, it's also a period that was signified by drought,
10 not quite as severe as we've seen this last summer.

11 **Q.** Would you describe these periods of drought and wet
12 summers as fairly cyclical?

13 **A.** It is, sir.

14 **Q.** Mr. Lancaster discussed with you the PM attainment
15 modeling, and it was your testimony, I believe, that that
16 modeling showed that North Carolina, in Davidson and
17 Catawba Counties, was modeled to attain in 2010. Is that
18 what that modeling showed?

19 **A.** In that modeling that we did for that State
20 Implementation Plan, that is correct, yes.

21 **Q.** And was that modeling based on assumed controls that
22 would be put on pursuant to the Clean Air Interstate Rule?

23 **A.** It is. That modeling's foundation was the modeling
24 that's been discussed at quite length from the VISTAS
25 modeling group.

1 Q. And the Clean Air Interstate Rule, as I think we've
2 heard several times before, has been vacated?

3 A. Yes, sir.

4 Q. And does that call into question the validity of that
5 State Implementation Plan modeling?

6 A. It does.

7 Q. With regard to the NOx insignificance issue, it was
8 your testimony, I believe, that a change of 0.1 micrograms
9 per meter cubed was not insignificant for interstate
10 transport. Was that your testimony?

11 A. A delta or a change? From zero-out modeling, a .01
12 micrograms is not considered significant as an interstate,
13 or across state boundaries, level of transport to another
14 nonattaining area.

15 Q. And is that conclusion based on EPA's work in which
16 EPA indicated that it would not regulate interstate links
17 at a level below .2 micrograms per meter cubed
18 (inaudible) --

19 (Interrupted by the court reporter.)

20 Q. My question was, was that statement by Mr. Bridgers a
21 reflection of the fact that the Environmental Protection
22 Agency, under the Clean Air Interstate Rule, under the
23 Clean Air Act, made a determination that it would not
24 regulate interstate pollution that contributed at a level
25 of .2 micrograms per cubic meter cubed or less.

1 **A.** In the now-vacated CAIR ruling, a level of
2 significance of .2 micrograms for interstate, or across
3 state, transport to a nonattaining area downwind in
4 another state was set as the level of significance. There
5 was no level of significance set for intra, or within one
6 state boundary.

7 **Q.** With regard to the NOx insignificance, I want to be
8 clear. Was it your statement that EPA has not agreed with
9 that finding?

10 **A.** As of this point, we had not fully exchanged
11 additional information with EPA, after this pre-hearing
12 draft that was provided to them, for further analysis that
13 we've done that would demonstrate that North Carolina does
14 not, under the current Clean Smokestacks Act, have an
15 interstate, across-state-boundary, level of significance
16 of .2 micrograms in any nonattainment area.

17 **Q.** Okay. I want to turn back now to the University of
18 Maryland study. With regard to this study, is it your
19 understanding that this study was ever published?

20 **A.** To my recollection, it's never been published in any
21 recognized trade journal.

22 **Q.** And do you know if this study was ever peer reviewed?

23 **A.** To my knowledge, it was never peer reviewed.

24 **Q.** Can you describe for the Court the process that led
25 to the creation of this report?

1 A. The State of North Carolina, through a series of two
2 contracts, has contracted with the State of Maryland for
3 air quality research flights in and around North Carolina.
4 This was a part of a larger project that the University of
5 Maryland had undertaken with other states in the
6 Mid-Atlantic, such as Maryland.

7 When we entered into the contract, the thought was to
8 have a project that would allow us to do some initial
9 research into air pollution levels above the ground in the
10 state. Most all of the air quality monitoring is
11 ground-based. For a number of years we maintained an air
12 quality monitor atop WREL television broadcast tower, and
13 we noticed, as we do with our ridge-top monitors, unique
14 differences with air quality aloft as we do at the
15 surface.

16 So this study was an initial look to see if we could
17 capture some of that information with aircraft flights.

18 The original contract, unfortunately, was disjointed
19 because of issues with establishing the initial contract,
20 so we were never able to fully fly, in the first year, the
21 flight hours that we had anticipated. That stretched into
22 the second year, which we did through a no-cost contract
23 extension.

24 At the end of that period, we continued to want
25 further information as a basis that this was an area that

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1 we needed to spend a lot of money. We were already
2 spending a lot of money. So we did another contract with
3 the University of Maryland, which would encompass when
4 this report was written. And it's in that contract that
5 we also experienced problems with scheduling flights
6 because of priority that was given to states that had a
7 longer-term record with this project, such as Maryland.
8 So we never flew all of the events that we wanted to fly,
9 and some of the events that were of most importance to
10 North Carolina took a back seat to instances that were
11 happening up in the mid Atlantic.

12 This report was in keeping with the project, that
13 some documentation would flow out of it. Upon reflection
14 on the corrections that I made in my deposition, Nick
15 Whitcraft did have a hand in creating this document. It
16 was created primarily because this was quite a unique
17 event in North Carolina, to have such high ozone levels
18 just in Charlotte that weren't experienced in other parts
19 of the state without that regional background that we see
20 sometimes, or more often than not, that we talked about
21 earlier from our sentinel monitors.

22 So it was unique in a lot of capacities, and so Nick
23 wanted to basically create a white paper here in
24 summarizing that. And so there was an exchange between
25 Nick and Dr. (inaudible) who was the --

1 (Interrupted by court reporter.)

2 **A.** Yeah. Actually, let me spell that.

3 It was a corroboration between Nick Whitcraft and
4 Dr. Jackson Marufu, M-a-r-u-f-u, with the University of
5 Maryland. Dr. Marufu was not the initial project
6 investigator or project scientist on this. He actually
7 fell into that position after the original principal
8 investigator Dr. Bruce Doddridge left for an appointment
9 with the National Science Foundation and then further with
10 an appointment -- or a job with NASA Langley in Virginia
11 Beach.

12 **Q.** Just wanted to clarify. Under the contract, was
13 North Carolina allowed -- did North Carolina have the
14 total number of hours flown that it had requested to be
15 flown with respect to the contract?

16 **A.** In either contract, we did not fly the entire number
17 of hours that were anticipated initially in the contract.

18 **Q.** And North Carolina also was not permitted to fly the
19 particular episodes that it wanted to fly due to conflicts
20 with other contracts with regard to these planes.

21 **A.** That's a fair assessment, yes, sir.

22 **Q.** Were there any limitations with regard to the
23 equipment that was on these planes?

24 **A.** Unfortunately, that's another aspect of this project
25 that wouldn't have been a product of projects if we had

1 had millions of dollars to invest in this research. The
2 aircraft, at least in the first contact, did not have
3 basic meteorology measurements, such as wind speed and
4 wind direction, did not in the first or second contract
5 have NOx measurements.

6 Q. And this paper seems to be a write-up of a single
7 episode, not multiple flights?

8 A. That would be correct.

9 Q. So is this a valid statistical example of ozone
10 events in North Carolina?

11 A. Absolutely not.

12 Q. Now, if you'll turn to page 1 of the document, sir.

13 A. I have it.

14 Q. I just want to make one thing clear. On the second
15 paragraph, does the second sentence of that paragraph
16 confirm what you just said in regard to the unique nature
17 of this episode, the sentence that reads, "This episode
18 was quite different from typical high ozone episodes seen
19 in the past"?

20 A. I'm sorry. Could you repeat the question?

21 Q. Does this sentence affirm your previous testimony
22 regarding the unique nature of this particular ozone
23 episode?

24 A. Yes, sir.

25 Q. So in your experience, it's rare to have a high ozone

1 event in the Charlotte area that is not at least partially
2 influenced by regional sources?

3 **A.** That is a rarity, yes, sir.

4 **MR. BERNSTEIN:** No further questions, Your
5 Honor.

6 **MR. LANCASTER:** May I ask just a few more?

7 **THE COURT:** Yes.

8 **REDIRECT EXAMINATION**

9 **BY MR. LANCASTER:**

10 **Q.** Mr. Bridgers, you counted up the number of code
11 yellow days in Charlotte in 2007 in your
12 cross-examination?

13 **A.** I believe it was the number of code yellow and higher
14 days, yes, sir.

15 **Q.** Code yellow corresponds to moderate air quality;
16 isn't that correct?

17 **A.** That is correct, sir.

18 **Q.** And you testified that you had some concerns about
19 the modeling that underlay the PM2.5 attainment
20 designation which was introduced as Exhibit 101, is that
21 correct, in light of the vacatur of CAIR?

22 **A.** That would be correct, yes, sir.

23 **Q.** Is that being withdrawn?

24 **A.** We've actually never formally submitted the PM2.5
25 package. It's still in a pre-hearing draft form.

1 Q. Do you intend to go forward with it?

2 A. The decisions on how we treat the PM2.5 SIP has not
3 been decided within the Division of Air Quality at this
4 time as to how we're going to proceed, given the very
5 recent vacatur of the CAIR rule.

6 Q. Now, you indicated some information about monitors in
7 the mountain ridges. It is true, sir, isn't it, that in
8 Asheville and on the mountain ridges, ozone levels in the
9 summertime have a high frequency of being higher,
10 occasionally above the National Ambient Air Quality
11 Standards, when winds blow from the direction of Atlanta.
12 Is that correct?

13 A. There is a correlation in frequency of high -- or
14 elevated ozone events that occur from Atlanta, yes, sir.

15 Q. I noticed you looking at the map during the break.
16 Did you know TVA has two power plants near the Knoxville
17 area, Bull Run, and Kingston?

18 A. I knew that prior to looking at the map. I was just
19 enjoying --

20 Q. And you made some reference to Knoxville. Are you
21 aware that all ten plants at combined Bull Run and
22 Kingston plants are equipped with SCRs?

23 A. I was not immediately aware of that, no, sir.

24 Q. Are you aware that those SCRs operate not only during
25 the ozone season but also what is known as the shoulder

1 months around the ozone season?

2 **A.** I do not know that immediately, no, sir.

3 **MR. LANCASTER:** I have no further questions,
4 Your Honor.

5 I believe, if I understood correctly, the Court
6 deferred ruling on Defendant's Exhibit 116, the case study
7 on the most severe ozone study for 2005. I would move
8 that into admission.

9 Mr. Bridgers testified that he was a co-author,
10 and the primary author was Mr. Whitcraft, an employee of
11 the North Carolina Division of Air Quality. I believe the
12 objection was hearsay, but under 801(d)(2)(D), that
13 document is prepared by a party's agent within the scope
14 of his employment.

15 **THE COURT:** I'm going to sustain the objection.
16 Give the defendant an exception.

17 **MR. LANCASTER:** Thank you, Your Honor.

18 **THE COURT:** Yes. Thank you.

19 You're excused, Mr. Bridgers, and that will
20 complete your testimony.

21 All right. Call your next witness.

22 **MS. COOPER:** Your Honor, TVA calls Quincy Styke.
23 >>>
24 >>>
25 >>>

1 QUINCY STYKE, III,
2 being duly sworn, was examined and testified as follows:

3 DIRECT EXAMINATION

4 BY MS. COOPER:

5 Q. Mr. Styke, would you please state your name?

6 A. Quincy Neil Styke, III.

7 Q. And where do you live, Mr. Styke?

8 A. I live in Madison, Tennessee, a suburb of Nashville.

9 Q. What is your educational background?

10 A. I have a bachelor of science degree in biology from
11 Middle Tennessee State University from Murfreesboro,
12 Tennessee. I received that degree in 1974. I also have a
13 master of public health degree from the University of
14 Tennessee at Knoxville, Tennessee. I received that degree
15 in 1980. And I'm trained as an industrial hygienist.

16 Q. Sir, what is your current employment?

17 A. I work for the Tennessee Department of Environment
18 and Conservation's Division of Air Pollution Control.19 Q. Would you describe for us your work history at the
20 Tennessee Department of Environment and Conservation,
21 otherwise known as TDEC.22 A. Yes, ma'am. I joined the division in 1975 and worked
23 five years as an inspector in the division's Knoxville
24 field office. I transferred to the Nashville central
25 office and became chief of enforcement, for approximately

1 12 years.

2 After that, in 1993, I became the assistant director
3 of the Tennessee Air Pollution Control Division. In 2000,
4 I became the deputy director, and I serve in that capacity
5 at the present.

6 **Q.** Would you describe your duties and responsibilities
7 as deputy director?

8 **A.** Yes. I supervise, or exercise direct supervision
9 over all program managers and indirect supervision over
10 all program staff. These individuals conduct all types of
11 air quality management activities, from ambient air
12 monitoring, from emission inventory, control strategy
13 development, regulatory development, permitting,
14 inspections, enforcement, stack testing, continuous
15 emission monitoring, vehicle emission testing, asbestos
16 demolition and renovation, the Visible Emissions
17 Evaluation School, and I also coordinate the most complex
18 testimony to the Tennessee Air Pollution Control Board
19 with the staff.

20 **Q.** Now, what is the relationship between TDEC and the
21 Tennessee Air Pollution Control Board?

22 **A.** Our enabling legislation is specified at Tennessee
23 Code Annotated, Section 68-201-101, et seq.

24 The board is a 14-member group of citizens from
25 across the state of Tennessee. Their makeup is described

1 at TCA 68-201-104 of the act. And it's their
2 responsibility to take the broad statutory mandates and
3 duties imposed under the Tennessee Air Quality Act and put
4 them into regulations, to hold hearings, and to issue
5 orders, such that the broad statutory goals and duties
6 under the act are implemented.

7 The staff at TDEC's Division of Air Pollution Control
8 is the technical arm of the board and do all the studies
9 that are necessary to develop regulations, assist in the
10 permitting, and to advise the board on all matters
11 pertaining to air quality management.

12 Q. Thank you.

13 Now, are you familiar with the Tennessee Air Quality
14 Control Act?

15 A. Yes, ma'am, I am.

16 Q. Would you tell the Court what the purpose of the
17 Tennessee Air Quality Control Act is.

18 A. That's specified at TCA, or Tennessee Code Annotated,
19 68-201-103. And paraphrasing it, it asked us to -- both
20 the department and the board are to protect the public
21 health and the welfare from the adverse effects of air
22 pollution and, in doing so we're to maximize industrial
23 development and full employment of the state to the extent
24 possible.

25 Q. All right, sir. Now the Tennessee Air Quality

1 Control Act sets forth some matters that TDEC or the board
2 is to consider when exercising its powers to control air
3 pollution in Tennessee. Can you tell us about what those
4 matters are?

5 **A.** Yes. There are six matters, and they're specified at
6 TCA 68-201-106 of the act.

7 There is a preface paragraph that says that the
8 department and the board are to regulate air pollution in
9 outside environments, inside works and shops or to affect
10 relations between employers and employees are in line with
11 OSHA, or in the case of Tennessee, TOSHA, Tennessee
12 Occupational Safety and Health Administration.

13 The six matters that we look at first are the
14 character and degree of injury to or interference with the
15 protection of public health.

16 Now, character means would a contaminant be very
17 toxic, like arsenic, or would it be more moderate and
18 nuisance related, like limestone dust.

19 Degree would pertain to how much air pollution was
20 being emitted; was it emitted in minuscule quantities or
21 very large quantities.

22 Interference with protection of public health would
23 be resolving chronic noncompliance that requires us to go
24 and visit a source over and over to get them into
25 compliance.

1 And harm would be actual harm, such as the evacuation
2 of a community or an ambient air quality exceedance.

3 The next matter we consider is the technical
4 practicability and economic reasonableness of controlling
5 air pollution. Does the science and technology exist to
6 control air pollution and, if so, is it available at an
7 affordable cost.

8 Then we look at the suitability or the unsuitability
9 of the source to the area that it's located. And we have
10 differing requirements according to the zones of the
11 state, specifically attainment areas and nonattainment
12 areas. Nonattainment areas have much more stringent
13 standards. And then we look at things like population
14 density versus rural, and topographical relationships;
15 like -- if I may illustrate with my hands -- if it's level
16 and the plume rises and goes off, that's not as serious a
17 concern as if the plume rises in a valley and impacts a
18 group of citizens located high on a hill.

19 Then we look at the socioeconomic value of the source
20 to the community. We feel that all sources provide some
21 economic benefit to the community: Employment, purchase
22 of local goods and services, social value. If it's a
23 not-for-profit, like an animal shelter, school, public
24 hospital, we try to give some latitude out to those type
25 sources.

1 We look at the amount or degree of good faith effort
2 that somebody exerts to attain and maintain compliance.

3 We also look at the economic benefit that somebody
4 might enjoy as a result of noncompliance. If you have two
5 companies that install -- that make the same thing and
6 company A installs air pollution control equipment and
7 company B does not, company B does not have as high a unit
8 cost of production, so we're supposed to try to remove
9 that benefit if that should occur.

10 **Q.** And when are these matters taken into account?

11 **A.** Generally, the first four matters are taken into
12 consideration in developing rules and permit standards,
13 and all six matters are taken into account in taking of an
14 enforcement action.

15 **Q.** So that if I might summarize, when rules are being
16 established or when permits are being issued, you take
17 into account injuries to the public health.

18 **A.** Right.

19 **Q.** The social and economic value of the contaminant
20 source.

21 **A.** Correct.

22 **Q.** The suitability or unsuitability of the source in the
23 location.

24 **A.** Yes.

25 **Q.** And the technical practicability and economic

1 reasonableness of reducing emissions from the source.

2 A. Yes, that's correct.

3 Q. Does TDEC issue operating permits to sources of air
4 emissions?

5 A. Yes, we do.

6 Q. What is the purpose of such permits?

7 A. First and foremost, the operating permit authorizes
8 the legitimate operation of the source within the state of
9 Tennessee. It indicates that it's undergone our standard
10 of review and has been determined to be worthy of a
11 permit.

12 For coal-fired electric generating units, or EGUs as
13 they're sometimes called, those type of sources are
14 subject to a federal major source operating permit program
15 known either as Title V or Part 70. The regulations are
16 specified at 40-CFR Part 70.

17 And there are three big aspects of that program.

18 First, it is to consolidate all applicable
19 requirements that may be subject -- that the facility may
20 be subject to, both at the state and federal level, on a
21 single source document.

22 The second thing is that it requires much more
23 self-examination on the part of the source and reporting
24 of any noncompliance that it may discover. This is used
25 to augment our own independent review of the source's

1 compliance status.

2 Lastly, it enhances public participation. We're
3 required to place that application in a public depository,
4 a draft permit. There is a clause known as affected state
5 notification. If the source is within 50 miles of a state
6 border, we have to notify that neighboring state that
7 we're -- we received an application and we're about to
8 take an action.

9 Now, one aspect about the Part 70 permits -- these,
10 again, are federal permits -- just about anyone has
11 standing to make a comment on this permit as long as they
12 comply with the requirements pertaining to public
13 participation specified in the federal rule.

14 **Q.** Has TDEC issued operating permits to all except one
15 of TVA's coal-fired power plants in Tennessee?

16 **A.** That's correct. We've issued -- there are seven
17 plants in Tennessee. We've issued permits to six of those
18 plants. One plant, the Allen steam plant operates under a
19 local air pollution control program, much like the one
20 here in Asheville, North Carolina, and that local air
21 pollution control program has issued a permit to the Allen
22 steam plant.

23 **Q.** So all of TVA's plants in Tennessee have operating
24 permits?

25 **A.** That's correct.

1 Q. Now, you mentioned public comment on operating
2 permits. Does TDEC have procedures for allowing public
3 comment on operating permits?

4 A. Yes, we do. As I mentioned earlier, we place the
5 application in a public depository, draft permit in the
6 public depository. We hold a public hearing. We receive
7 and compile permits. That permit is shared with the
8 United States Environmental Protection Agency. They
9 conduct their review, and then upon receipt of all the
10 comments and any modifications to the permit as a result
11 of those comments, the permit is issued.

12 Q. And has TDEC ever received comments from the State of
13 North Carolina on draft permits that TDEC proposes to
14 issue through TVA plants?

15 A. No, we have not.

16 Q. Mr. Styke, does TDEC take into account interstate
17 transport of pollutants in developing its SIP and
18 implementing regulations?

19 A. Yes, we do. Our responsibilities can be
20 characterized as three overarching responsibilities.

21 The first thing we have to do is protect the health
22 and welfare of the citizens of the state of Tennessee from
23 the adverse effects of air pollution.

24 The second thing that we have to do is we have to
25 ensure that the emissions from the state of Tennessee do

1 not unduly or significantly contribute to the efforts of a
2 neighboring state to clean up their air and protect the
3 health and welfare of their citizens.

4 And lastly, we have a fundamental duty to obey
5 federal and state law that's pertinent to our mission of
6 protecting air quality. And to specify a little bit more
7 of that, the Federal Clean Air Act has a provision at
8 Section 110(a)(2)(D), as in David, and that's often called
9 The Good Neighbor Provision, and we have to ensure in our
10 State Implementation Plan -- I'll explain what that is in
11 just a second -- we have to ensure that we do not
12 significantly contribute to neighboring states, and we
13 have to make a presentation to the United States
14 Environmental Protection Agency to that effect as part of
15 their approval of our SIP.

16 Now, I use that term "SIP." That stands for State
17 Implementation Plan. And the way the Clean Air Act works,
18 the Federal Clean Air Act works, is EPA establishes
19 standards of how pure the air should be in all 50 states
20 of the nation. Each state has to prepare a plan called a
21 State Implementation Plan that shows how we will attain
22 and maintain compliance with those federally-established
23 standards; and we have to show in that plan that we're
24 protecting air quality within Tennessee, and then, under
25 Section 110(a)(2)(D), we have to show that we do not

1 adversely impact neighboring states in their efforts to
2 prepare their State Implementation Plan.

3 Now, there is a section in the Federal Clean Air Act
4 known as Section 126, and it gives states the opportunity
5 to petition the United States Environmental Protection
6 Agency and make an allegation that the state in question
7 is not protecting interstate air quality under
8 Section 110(a)(2)(D). EPA has a certain amount of time to
9 react to that, and if EPA finds that, you know, such a
10 source or group of sources are adversely impacting a
11 neighboring state, it will issue an order giving up to
12 three years to abate those emissions that the United
13 States Environmental Protection Agency has deemed to be
14 excessive.

15 You can take more time, but after three years you
16 leave the realm of Section 126 and go to the enforcement
17 part of the Clean Air Act, Section 113.

18 Q. Thank you, sir.

19 Now, has TVA complied with its operating permits with
20 respect to sulfur dioxide and nitrogen oxide?

21 A. Yes, ma'am, it has.

22 Q. How do you know?

23 A. As coal-fired electric generating units, TVA is
24 required under federal regulations, at 40 CFR, Part 75, to
25 install, maintain, record and report continuous emissions

1 of its sulfur dioxide levels and its nitrogen oxide
2 levels. They submit these reports to the state quarterly
3 for review.

4 We go out and we audit these monitors to make sure
5 they're giving true and correct readings of the SO₂ and
6 NO_x emissions. And as a Title V permit source, in
7 addition to those quarterly reports of emission levels,
8 they have to turn in semi-annually, twice a year, a report
9 that identifies every time they deviated from their permit
10 requirements, in other words, if they were in
11 noncompliance, and once per year there has to be an annual
12 compliance certification done by a responsible official --
13 that's a person at the highest levels of the source --
14 that states they were or were not in compliance with the
15 terms of their permits.

16 Q. Do you believe that these reports from TVA are
17 accurate?

18 A. I have no doubt in my mind that they're accurate. In
19 addition to the quality assurance efforts of the State of
20 Tennessee to ensure that the monitors are giving true and
21 correct readings, there are significant criminal penalties
22 for the falsification of data, and I don't know any source
23 that does that. If they do, they would certainly be in a
24 whole lot of trouble.

25 Q. If TVA were to violate a permit requirement, what

1 would TDEC do?

2 A. First of all, we would issue a citation informing
3 them that we had determined they had violated a specific
4 rule or rules.

5 After that time, they would be given the opportunity
6 to provide additional information to show cause, if you
7 will, that the finding of noncompliance may have been
8 erroneous, or there could be some mitigating factors
9 associated with the noncompliance that would influence the
10 enforcement outcome in the process.

11 After we have reviewed all the available information,
12 a unilateral order would be issued from the Office of the
13 Technical Secretary under the provisions of Tennessee Code
14 Annotated, Section 68-201-116, and that would be an order
15 that could be appealed within 30 days of its receipt, or
16 the source could simply comply with the terms of the
17 order.

18 If the noncompliance was ongoing, the order would
19 prescribe a schedule for corrective action that the agency
20 deemed expedient in the technical likelihood that it would
21 solve the noncompliance, and if a civil penalty was
22 warranted, it would specify the civil penalty.

23 Now, if we determined, in review of the
24 circumstances, that the circumstances were more criminal
25 than civil, we would refer that matter to our criminal

1 investigator for further evaluation. But if it continues
2 through the civil process in administrative law, the order
3 could be accepted, complied with, or it could be appealed.

4 If it was appealed, we could enter into settlement
5 negotiations, and if those settlement negotiations
6 produced an agreed final order, it would not be final
7 until the state Air Pollution Control Board had had an
8 opportunity to review and ratify that order.

9 If we were unable to come to settlement negotiations
10 and produce an agreed final order, it would be handled as
11 a contested case under the Tennessee Uniform
12 Administrative Procedures Act -- and that's found at TCA
13 4-5-300 series -- and then the board would issue an order
14 in the matter, and if the respondent still disagreed with
15 the determination, it could be pursued in the chancery
16 court of Davidson County.

17 Q. Thank you, sir.

18 Does TDEC have statutory authority with respect to
19 public nuisances in Tennessee?

20 A. Yes, ma'am, we do. That's specified at Tennessee
21 Code Annotated, Section 68-201-112(d), as in David. And
22 that basically gives the board and the Commissioner of the
23 Department of Environment and Conservation the authority,
24 (a) to determine whether a public nuisance exists or does
25 not exist; and then (b) the authority to issue an order

1 for the abatement of that public nuisance.

2 Q. Has TDEC ever determined that TVA's air emissions
3 constitute a public nuisance?

4 A. No, ma'am, we have not.

5 Q. Thank you.

6 Are you familiar with TVA's air pollution control
7 activities at its Tennessee coal-fired plants?

8 A. Yes, ma'am, I am.

9 Q. Now, you're familiar with the Bull Run plant in east
10 Tennessee?

11 A. Yes, ma'am. It's in Anderson County.

12 Q. And you're familiar with the scrubber that is
13 virtually completed at that plant?

14 A. Yes. I attended the ground-breaking ceremony for
15 that scrubber, and I frequently go by and evaluate the
16 construction progress on it. It's well underway and
17 should be complete by the fall of 2008 and should be
18 started up no later than January, 2009.

19 Q. Do you have any reason to believe that TVA will not
20 operate the Bull Run scrubber?

21 A. I have no reason whatsoever to believe that TVA will
22 not operate that scrubber. They have spent over
23 \$300 million to install the scrubber.

24 We are relying on those reductions as part of our
25 State Implementation Plan. I described that process

1 earlier. We have to do a State Implementation Plan to
2 address PM2.5 nonattainment, both in the greater Knoxville
3 area and the multi-state Chattanooga area, and that also
4 includes the states of Georgia and Alabama, and we are
5 relying on those reductions.

6 As part of the SIP process under EPA rules and
7 regulations, we have to ensure that the emissions
8 reductions from those scrubbers are permanent,
9 quantifiable, and federally enforceable.

10 I'm absolutely certain that TVA will operate those
11 because we'll ensure that they operate those.

12 Q. And are you similarly familiar with the scrubbers
13 that are under construction at the Kingston plant in east
14 Tennessee?

15 A. Yes, ma'am, I am. Those are in Roane County. And,
16 like Bull Run, we're going to have to rely on those
17 reductions as contingency measures in the preparation of
18 our State Implementation Plan. You have to have measures
19 in place that should take you there, and then you have
20 contingency measures, or a plan B or an alternate plan
21 that if your original plan didn't work these measures
22 would automatically take effect and carry the day and make
23 sure that you did attain.

24 So we are relying on reductions at the Kingston steam
25 plant as contingency measures for our PM2.5 SIP in the

1 greater Knoxville area and also the greater Chattanooga
2 multi-state area, as I previously described.

3 Q. So you have reason to believe that TVA will complete
4 and operate the scrubbers at the Kingston plant.

5 A. There is no question in my mind that they will
6 complete those and operate those. As part of our State
7 Implementation Plan, we will require the operation of
8 those scrubbers.

9 Q. Are you familiar with TVA's plans for installing
10 additional controls at its John Sevier plant in east
11 Tennessee?

12 A. Yes, ma'am, I am. The John Sevier steam plant is in
13 Hawkins County, Tennessee, and that's in upper east
14 Tennessee.

15 TVA has announced that it will install flue gas
16 desulfurization units or scrubbers to remove sulfur
17 dioxide by the year 2012 on the four units at John Sevier.
18 It will be a two-part construction project, one part
19 occurring mid year, the other part occurring at the end of
20 the year.

21 After that, they will apply a technology to control
22 oxides of nitrogen emissions, known as HERT, H-E-R-T.
23 Stands for high energy reagent technology. And it's a
24 chemical reaction that occurs to use ammonia or urea to
25 chemically break down oxides of nitrogen into elemental

1 nitrogen, carbon dioxide, and water.

2 That is already installed on one of the units. Next
3 year, it will be installed on all the remaining three
4 units, so all four units will be controlled with HERT
5 technology.

6 And then when TVA finishes installing the scrubbers
7 at the four units to remove sulfur dioxide, it will be
8 able to remove the electrostatic precipitators, because
9 the scrubbers will also control the particulate emissions
10 and create a footprint, or real estate, where selective
11 catalytic reduction, the Cadillac of oxides of nitrogen
12 control, can be installed. And that will be done by mid
13 2014 for two units and the end of 2014 for the other two
14 units. So it will be a very well-controlled facility.

15 I might also add -- I heard some people talking about
16 mercury -- that when flue gas desulfurization is operated
17 in conjunction with selective catalytic reduction,
18 selective catalytic reduction does oxidize the mercury,
19 but it makes it more snaggable, if you will, for the
20 scrubbers, and you see about an 85 percent reduction in
21 mercury.

22 So all up and down the east Tennessee Valley, the
23 three Tennessee Valley Authority plants, Kingston, Bull
24 Run, and John Sevier, will not only be controlled for
25 sulfur dioxide at the highest level; they'll also be

1 controlled for oxides of nitrogen at the highest level,
2 and there will be about an 85 percent reduction in mercury
3 emissions expected, too.

4 Q. Mr. Styke, do you have any doubt that TVA will build
5 and operate the controls that it has planned at John
6 Sevier?

7 A. Absolutely not. We also, in addition to the PM2.5
8 SIPS, have to prepare what's called a Regional Haze State
9 Implementation Plan to address visibility impairment in
10 Class I areas, like the Great Smoky Mountains, the Great
11 Smoky Mountains National Park and the Shenandoah National
12 Park, and we have to have permanent, enforceable,
13 quantifiable measures in place there. We're going to have
14 to ensure -- We've turned in our State Implementation Plan
15 to EPA. Some reliance on that State Implementation Plan
16 was given to the Clean Air Interstate Rule, or CAIR, and
17 its vacatur will cause us to rethink, you know, the
18 preparation of those State Implementation Plans because
19 EPA had already determined that the CAIR Rule resulted in
20 permanent, quantifiable, and federally enforceable
21 measures and could be relied upon to address interstate
22 air quality. That's gone.

23 Our state Air Pollution Control Board is scheduled to
24 meet on August 13, 2008. You may recall that the CAIR
25 vacatur was announced in July, July 11th, I believe it

1 was, of this year, and so they haven't had an opportunity
2 to formally meet and react to that vacatur. But we will
3 have to do that. TVA has a long-standing relationship
4 with the Tennessee Air Pollution Control Board. It's
5 pledged to make control reductions, and they have done --
6 they've honored every one of their pledges, and I am
7 certain we'll do that, and we still have the backstop.
8 The vacatur of CAIR is going to mean we're going to have
9 to go at it a different way. The vacatur of CAIR does not
10 excuse the obligations of the state under
11 Section 110(a)(2)(D), nor Section 126 of the Federal Clean
12 Air Act. We have to address those measures.

13 **Q.** Now, Mr. Styke, the Court has heard testimony that
14 North Carolina believes some of TVA's plants are impacting
15 nonattainment areas in Tennessee.

16 Does the State of Tennessee have procedures and
17 programs in place to address nonattainment areas in
18 Tennessee?

19 **A.** Absolutely. When EPA comes out with a new National
20 Ambient Air Quality Standard, you have to look at the
21 existing air quality data and make recommendations to
22 EPA -- each governor has to make a recommendation to
23 EPA -- whether the area attains or does not attain that
24 particular National Ambient Air Quality Standard. EPA
25 starts a 120-day negotiation period, looks at the most

1 recent air quality data, and makes the final designation
2 of attainment or nonattainment.

3 If EPA designates an area nonattainment, generally
4 three years are given to the states to prepare a State
5 Implementation Plan, again, a plan that shows how it will
6 attain the standard and maintain that standard, and then
7 EPA reviews those plans, and once they're federally
8 approved they become federally enforceable.

9 In Tennessee, for PM2.5, we have the nonattainment
10 area in the Knoxville area, which includes Knox County,
11 Anderson County, Loudon County, Blount County, and a
12 portion of Roane County that surrounds the TVA Kingston
13 plant.

14 In the Chattanooga area, it's Hamilton County; it's
15 Jackson County, Alabama, the portion that surrounds TVA
16 Widows Creek; and two counties, I believe Walker and
17 Catoosa Counties in Georgia. So we have those PM2.5 areas
18 for the annual 15 micrograms per cubic meter national air
19 quality standard.

20 Now, letters are just about issued -- EPA is under a
21 consent decree to have designations for the new 24-hour
22 PM2.5 standard that's set at 35 micrograms per cubic
23 meter. They're about to start that 120-day consultative
24 process with the governors. So we expect around the end
25 of this year to see an announcement from EPA, what they've

1 determined to be the PM2.5 24-hour nonattainment areas,
2 and once that announcement is made, there will be a 90-day
3 period before there is an effective date.

4 Now, for ozone, there are two ozone standards to talk
5 about. One is the 1997 ozone standard. Tennessee entered
6 into what's called an early action compact with EPA and
7 attained that 1997 standard early in the Nashville
8 five-county area, the Chattanooga two-county area, and
9 Tri-Cities two-county area. We are not in attainment for
10 the 1997 ozone standard in the greater Knoxville area,
11 which would include Anderson, Loudon, Knox, Blount,
12 Sevier, Jefferson, that portion of Cocke County,
13 C-o-c-k-e, that encompasses the Great Smoky Mountains
14 National Park, and also Shelby County, which would be
15 Memphis, Tennessee. We do not attain the standards there.

16 The Knoxville area was designated by EPA as a Subpart
17 1/Basic area. There was a vacatur of that Part 1
18 Implementation Rule, and we're going to -- we're awaiting
19 guidance from EPA what's required there. And then we're
20 also doing a SIP in the Memphis area that's due March 1,
21 2009.

22 Now, there is a new standard, the 2008 ozone
23 standard. Mr. Bridgers spoke to it earlier in his
24 testimony. And it's been made much more restrictive than
25 the 1997 standard.

1 We'll have to make recommendations, governor letters
2 to EPA, by March 12, 2009, next year, and then about a
3 year later EPA will announce whether it has concluded
4 those areas are in attainment or nonattainment with that
5 2008 ozone standard. And then three years after that,
6 we'll have to turn in a State Implementation Plan that
7 specifies how we'll attain and maintain the new
8 2008 standard.

9 Q. Thank you, Mr. Styke.

10 Does TDEC authorize TVA to operate its plants in an
11 unreasonable way?

12 A. Absolutely not.

13 **MS. COOPER:** Thank you. I have no further
14 questions.

15 | THE COURT: Mr. Bernstein?

CROSS EXAMINATION

17 | BY MR. BERNSTEIN:

18 Q. Good afternoon.

19 A. Good afternoon.

20 Q. I'd like to talk to you about your nonattainment
21 areas for a few minutes.

22 A. Yes.

23 Q. My understanding from your testimony is you have two
24 areas that are still not attained for ozone. Is that the
25 Knoxville area and the Memphis area?

1 **A.** Yes, sir. For the 1997, 8-hour standard, they did
2 not attain that standard yet.

3 **Q.** And they haven't attained that standard in any year
4 since the standard was promulgated in 1997; is that
5 correct?

6 **A.** Well, actually, the Knoxville area did attain based
7 on 2004 through 2006 data, and we submitted a bid for a
8 redesignation to attainment to EPA.

9 Now, you may recall, in 2007, there were several
10 large forest fires in Florida and southern Georgia --
11 northern Florida and southern Georgia, and there are
12 satellite photographs of significant plume transport from
13 those states, about 900 square miles; 900 square miles of
14 forest burned in those states. And there's a procedure
15 called Exceptional Event Data Flagging, and we have asked
16 EPA, as have a number of other states, to flag certain
17 days where it appears that the transport of those
18 emissions would have caused a bias in air quality and show
19 nonattainment in ways that the State of Tennessee could
20 not possibly control. The EPA is supposed to give an
21 announcement in the next few months on the result of that.

22 But considering those 2007 readings, we no longer
23 measured attainment. But we did measure it on 2004 to
24 2006 data, and we do have an active request to have the
25 area redesignated attainment.

1 Q. Were you referring to PM2.5 with regard to the forest
2 fires?

3 A. 8-hour ozone, 1997 standards is what I was referring
4 to.

5 Q. But Knoxville presently is still nonattainment for
6 ozone?

7 A. It's designated it nonattainment, that's correct.

8 Q. And that area still has an ozone design value in
9 excess of the new ozone standard, correct?

10 A. Yes. One monitor measures attainment at Cades Cove,
11 but it's nullified by the fact -- Cades Cove is in Blount
12 County, Tennessee. There is also a monitor at Look Rock
13 in Blount County, Tennessee. It measures in excess of the
14 standard, so it would nullify the Cades Cove monitors
15 measurement of attainment.

16 Again, this is measurement attainment; it is not
17 designation of nonattainment. That won't occur until
18 about March of 2010.

19 Q. But the measurement of attainment is an indication of
20 the air quality in that area, whereas the designation is
21 simply a regulatory process.

22 A. Correct.

23 Q. So the fact that the air quality is not currently
24 below the 75 part-per-billion standard is an indication of
25 the fact that the air in the area is currently unhealthy.

1 A. Right. It's showing -- EPA sets the standard at 75
2 parts per billion, or .075 parts per million. That's the
3 standard set to protect public health and public welfare.
4 It's being exceeded.

5 And it would be safe to say that public health,
6 public welfare are not being sufficiently protected
7 because of those readings.

8 I might add that all throughout the Southeast,
9 monitors record in excess of that. This has been a
10 significant increase in the stringency of the standard,
11 and it's going to require a lot of effort, not only on the
12 part of the State of Tennessee, but the State of North
13 Carolina. All states are going to have to work hard to
14 attain the standard. It's very challenging.

15 Q. Mr. Styke, wouldn't expeditious implementation of, as
16 you described it, the Cadillac of NOx controls, SCRs, at
17 the John Sevier plant and the non-controlled units at
18 Widows Creek significantly assist that area in getting
19 below the standard?

20 A. I testified earlier that at Section 68-201-106 of the
21 Tennessee Air Quality Act, we look at the technical
22 practicability and economic reasonableness of controlling
23 air pollution. I also testified that at the John Sevier
24 steam plant, there is not real estate available to install
25 selective catalytic reduction until such time as the

1 scrubbers are installed, to not only remove sulfur dioxide
2 but also particulate emissions, and then at that time it
3 will be technically possible to remove the existing
4 electrostatic precipitators and install those Cadillac
5 selective catalytic reduction units.

6 Now, in the interim, I also testified that HERT --
7 that's a form of selective non-catalytic reduction -- it's
8 high energy and it's more effective than standard SNCR.
9 Standard SNCR has injection of ammonia or urea into the
10 flame. HERT injects it in the over-fired air.

11 The chemistry for selective catalytic reduction and
12 selective non-catalytic reduction is the same. Ammonia,
13 whether it's anhydrous or aqueous, and urea will
14 chemically react with NOx to break that down and form
15 nitrogen, water, and carbon dioxide.

16 The difference between SNCR and SCR is the physical
17 aspects of it. You have a temperature window that you
18 have to inject this reactant, or reductant is what it's
19 called, to reduce the NOx into harmless products, and if
20 you turn it in too cold, the ammonia does not react and it
21 slips out the stack. And that's a problem. Same with
22 urea. If you inject it too hot, the urea or ammonia will
23 decompose to NOx, and that will make a big problem.

24 So selective catalytic reduction, a catalyst, as you
25 may recall from your science, assists in a reaction and

1 promotes the reaction without taking part of the reaction
2 itself. So SCR gives you more residence time, better
3 mixing and temperature control than SNCR. However, HERT,
4 high energy reagent technology, compensates for that by
5 injecting it in the over-fire air ozone of the boiler and
6 getting a much better conversion of the ammonia and urea
7 and breaking down the NOx.

8 So I feel, and I'm sure the board will feel, that
9 this is a technically practicable, economically reasonable
10 approach. It's an expeditious approach to abating
11 emissions of both sulfur dioxide and oxides of nitrogen at
12 the John Sevier steam plant in Hawkins County, Tennessee.

13 | Q. Thank you very much.

14 With regard to Widows Creek, you're not aware of any
15 physical footprint limitations that would cause TVA to...
16 (inaudible) --

17 (Interrupted by court reporter.)

18 Q. Are you not aware of any footprint limitations at the
19 Widows Creek facility that would prohibit TVA from
20 installing SCRs on units 1 through 6 at that facility?

21 **A.** I testified that I was familiar with the Tennessee
22 plants. I'm less familiar with the TVA Alabama and
23 Kentucky plants.

I do believe that TVA is moving as quickly as they can on the Widows Creek plant, the Colbert plant in

1 Alabama, and Shawnee and the Paradise plant in Kentucky to
2 abate those emissions. But I could not tell you about
3 footprint issues or the design of the facility. I'm just
4 not familiar with the Alabama facility.

5 Q. And the Nashville area, sir, is currently not
6 attaining the 75 ppb standard either, is it?

7 A. That's correct. If you were to take the current
8 data, it does not attain the new 2008 ozone standard.

9 Q. And in fact, the Nashville area is just a hair below
10 the old 85 ppb standard, correct?

11 A. I don't know how you define "hair." But it's in
12 attainment. You're in or you're out.

13 Q. Isn't 1 or 2 parts per billion below the standard?

14 A. Within that, yes.

15 Q. So it's possible that if there was a bad
16 meteorological year, that that area could be nonattainment
17 for the old standard once again?

18 A. That's speculative. It would have to be a perfect
19 storm, when all the adverse inputs come into play.

20 Q. Now, the Nashville region is really right in the
21 middle of the Gallatin, Cumberland, and Johnsonville
22 plants?

23 A. Yes.

24 Q. And the Johnsonville and Gallatin plants comprise
25 over 2600 megawatts capacity all together?

1 A. That sounds correct to me.

2 Q. And that's on a scale similar to the Cumberland
3 plant?

4 A. Cumberland is 2600 megawatts.

5 Q. And of the 14 unit at Johnsonville and Gallatin, two
6 have SNCRs and none have SCRs; is that correct?

7 A. That sounds correct. If I may refer to a sheet that
8 I brought with me that summarizes the control levels at
9 all of the Tennessee TVA facilities, I'd like to refer to
10 that if I may.

11 **MR. BERNSTEIN:** Well, I think, Gary, if you
12 could pull up Defendant's Exhibit 2.

13 Q. (By Mr. Bernstein) Does that exhibit, admitted into
14 evidence already, indicate that of the 14 units at
15 Johnsonville and Gallatin, two units are controlled with
16 SNCR demonstration technology and none are controlled with
17 SCRs?

18 A. That's correct. They have low-NOx burner and
19 over-fired air technology to reduce oxides of nitrogen.

20 Q. And doesn't this exhibit indicate that the Gallatin
21 and Johnsonville plants together are actually larger than
22 the Cumberland plant?

23 A. They're larger than the Cumberland plant. I should
24 point out that with the combustion control at the facility
25 in Gallatin, it is running a .16 pounds per million BTU

1 NOx rate on an annual basis and a 0.15 pounds per million
2 BTU NOx rate at the ozone season. And for sulfur dioxide,
3 because they're using low-sulfur Powder River Basin coal,
4 it's running .6 pound per million BTU. Now, to me, that's
5 indicative of a well run plant with --

6 Q. If you --

7 A. Go ahead.

8 Q. Please finish your answer.

9 A. At New Johnsonville, they run an annual rate of .4
10 pounds per million BTU NOx rate on an annual basis and a
11 .36 pounds per million BTU heat input NOx rate on an ozone
12 basis.

13 They currently emit SO₂ at New Johnsonville at 1.43
14 pounds per million BTU heat input rate. I do know they're
15 in the process of testing low-sulfur coals, with the goal
16 in mind to dropping that to .9 pounds per million BTU SO₂.

17 Q. So the rate at Gallatin for NOx you said was .16
18 pounds per million BTUs?

19 A. On an annual basis, yes.

20 Q. And with regard to Johnsonville, the rate was .4?

21 A. Yes, on an annual basis.

22 Q. And new SCRs these days generally achieve a rate of
23 .07 pounds per million BTU; is that correct?

24 A. That's correct. Generally speaking, yes.

25 Q. So NOx emissions from those plants could be

1 significantly reduced if those plants installed selective
2 catalytic reductions?

3 **A.** They could. I would also like to point out that
4 TVA -- I believe they've already entered it into evidence
5 here -- that they'll be making an announcement that
6 beginning January 1, 2009, they'll operate their SCRs year
7 round and we should see even better NOx reduction on the
8 TVA system.

9 **Q.** And that was part of their plan to comply with the
10 Clean Air Interstate Rule requirement that required year
11 round NOx reductions in 2009, correct?

12 **A.** That's correct. But as I testified, as in other
13 instances, I have no doubt that TVA will do it, whether
14 the CAIR vacatur occurred or not, simply because of the
15 Section 110(a)(2)(D) interstate pollutant control; also,
16 the visibility State Implementation Plan that's due; and
17 also the PM2.5 standards.

18 I think there was some testimony earlier that the
19 State of North Carolina is championing a NOx
20 insignificance determination to EPA. The State of Georgia
21 is also doing that. Tennessee fully supports that
22 determination of NOx insignificance and what North
23 Carolina is doing.

24 **Q.** With regard to your testimony that you believe TVA
25 will engage in these reductions in order to comply with

1 obligations under Section 110(a)(2)(D), is the State of
2 Tennessee in the process of requiring TVA to do that by
3 inserting those conditions and limitations into TVA's
4 permits?

5 **A.** In fact, again, the CAIR vacatur was announced on
6 July 11th, and just that Monday, I believe that was the
7 7th, we mailed to TVA, and other facilities subject to
8 CAIR, those CAIR permits that did set into place those
9 reductions that would be required by CAIR.

10 Now, as I earlier testified, the vacatur of CAIR
11 poses an interesting dilemma, not only for the State of
12 Tennessee but for all states, including North Carolina,
13 that relied upon CAIR to implement its regional haze SIP,
14 its PM2.5 SIP, and, to a lesser degree, its ozone SIPS.

15 We're going to have to make sure that those CAIR
16 reductions are permanent, quantifiable, and enforceable,
17 and all other states will have to make sure of that, too.

18 Just because CAIR has been vacated does not excuse
19 any state from its obligation to comply with
20 Section 110(a)(2)(D) or Section 126 of the Clean Air Act.

21 **Q.** With regard to those sections, the import of those
22 sections is to eliminate the contribution from sources in
23 one state to nonattainment in another state. Is that
24 correct?

25 **A.** The significant contributions, yes.

1 Q. And so those sections say nothing about whether
2 emissions from one state are contributing to levels in
3 another state that may be below the National Ambient Air
4 Quality Standards but may be still having a significant
5 impact on the environment or health in those other states;
6 isn't that correct?

7 A. We have to assure that the efforts do not confound
8 the efforts of a neighboring state to attain and maintain
9 the National Ambient Air Quality Standards. If they're
10 below the standards, you know, that would be a call for
11 the United States Environmental Protection Agency to make.

12 Congress anticipated the phenomenon of interstate air
13 quality transport and put these two sections in the Clean
14 Air Act and gave EPA the responsibility to make those
15 determinations. Now, EPA did that with the CAIR rule, and
16 then when North Carolina sued EPA and had the CAIR rule
17 overturned, that sent EPA back to the drawing board.

18 It's important to remember that CAIR was not vacated
19 for being too strict. It was being -- CAIR was vacated
20 for not being strict enough. So it's reasonable to assume
21 that when EPA comes back with, I'll use a slang term, son
22 of CAIR, the successor to CAIR, it's reasonable to assume
23 it will be more stringent and address all the issues the
24 Court identified as being deficient.

25 Until that time, EPA has to revert back to basic

1 statutory determination. EPA, and only EPA, can make that
2 call.

3 Q. And are you familiar with the fact that when the NOx
4 SIP Call -- part of the NOx SIP Call with regard to
5 Georgia was vacated, it took EPA some eight or nine years
6 to finish the rule-making process to implement a plan for
7 Georgia?

8 A. Right. I think EPA encountered a lot of litigation.
9 You may remember -- I believe I saw your name on the case,
10 19-2000 -- where North Carolina sued EPA over the
11 implementation of the NOx SIP Call. You joined in with a
12 bunch of utilities to fight the rule. And those
13 challenges take time for EPA to resolve.

14 So, depending on the amount of litigation that ensues
15 following this vacatur of CAIR, it could take some time to
16 resolve.

17 Q. And you're aware, with regard to the NOx SIP Call,
18 that North Carolina didn't join in with a bunch of
19 utilities; we filed a separate brief based on separate
20 grounds than the utilities, aren't you?

21 A. I just know it was Appalachian Power, et al, against
22 TVA -- or versus TVA -- I mean EPA.

23 Q. You're not the first person to make that mistake in
24 this courtroom, sir.

25 And you're also aware that with regard to -- North

1 Carolina took that position with regard to 1-hour ozone,
2 but only a few short years later, with regard to
3 interstate ozone and the 8-hour ozone standard, North
4 Carolina was seeking to have interstate control
5 strengthened, correct?

6 A. The 126 petition that North Carolina filed? Yes,
7 I've read that.

8 It was interesting to me -- I believe it was on page
9 17, North Carolina listed the emissions of different
10 states -- Tennessee and North Carolina are two of them --
11 from 1999 to 2002, the year that you passed the Clean
12 Smokestacks Act, and it was an interesting legal
13 observation you made that states all around North Carolina
14 were reducing their sulfur dioxide emissions. North
15 Carolina's emissions were not only static, but increasing.
16 And it struck me as interesting that North Carolina
17 volunteered to be the control group and do nothing to
18 reduce sulfur dioxide emissions and then turn around and
19 say in that petition that because air quality had improved
20 in the state of North Carolina, that obviously proved that
21 other states were impacting.

22 I find that amazing that you could make that
23 argument.

24 And I might go on to say that had you extended it to
25 2005, the emissions went even higher and higher for sulfur

1 dioxide.

2 Q. And you're, I'm sure, familiar with when North
3 Carolina passed the Clean Smokestacks Act it urged the
4 State of Tennessee to engage in similar effort?

5 A. My understanding is the reason that North Carolina
6 passed the Clean Smokestacks Act was the SAMI process,
7 which I participated in from its inception, revealed that
8 North Carolina's phase two acid rain plants had relied on
9 purchasing reductions from afar rather than controlling
10 them in the state of North Carolina, and it was
11 embarrassing how much the SO₂ emissions were in North
12 Carolina versus the neighboring states. And North
13 Carolina had to scramble and address that finding of SAMI;
14 that your emissions were so high simply because you had
15 been purchasing allowances from afar.

16 Q. And you're referring to Duke and Progress Energy, not
17 the State of North Carolina, correct?

18 A. I'm referring to the composite amount of emissions
19 from the state of North Carolina that precipitated the
20 enactment of the Clean Air Smokestacks Act -- or Clean
21 Smokestacks Act.

22 Q. And has Tennessee -- after North Carolina has enacted
23 the Clean Smokestacks Act, has Tennessee enacted similar
24 legislation?

25 A. Tennessee has not enacted similar legislation because

1 it's not necessary. We do our State Implementation Plans,
2 as I previously testified. We make sure that the areas in
3 Tennessee will attain and maintain the National Ambient
4 Air Quality Standards, as the federal -- the law and
5 regulations require. We have to certify under
6 Section 110(a)(2)(D) in those SIPs that we do not cause
7 significant contribution to neighboring states' efforts to
8 protect their quality, and we follow all the federal
9 rules. We don't need a statute. Instead of analyzing
10 emissions with all these technical studies I've been
11 seeing, Tennessee has been about the business of
12 controlling its emissions.

13 **MR. BERNSTEIN:** I have no further questions,
14 Your Honor.

15 **THE COURT:** Ms. Cooper?

16 **MS. COOPER:** I have nothing further, Your Honor.

17 **THE COURT:** All right, sir. Thank you. That
18 will complete your testimony and you may be excused.

19 **THE WITNESS:** Thank you, Judge. It's been my
20 pleasure being here.

21 **THE COURT:** All right. We'll take a recess
22 until 2:15.

23 **(Recess.)**

24 **THE COURT:** Mr. Lancaster?

25 **MR. LANCASTER:** Tennessee Valley Authority calls

1 | Dr. Anne Smith.

2 **MS. GOODSTEIN:** Your Honor we have a motion in
3 limine pending with regard to Dr. Smith. She's an
4 economist. We're not objecting to her testifying as an
5 expert in the field of economics, but she also has, as
6 part of her report, some public health opinions, and we
7 have filed a motion in limine to exclude those because of
8 her lack of qualifications in that area.

9 **THE COURT:** All right. Make your objection at
10 the appropriate time and I'll rule on it.

11 MS. GOODSTEIN: All right. Thank you, Your
12 Honor.

13 THE COURT: Yes.

14 ANNE ELIZABETH SMITH,
15 being duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

17 | BY MR. LANCASTER:

18 Q. Would you please state your full name for the record?

19 A. Anne Elizabeth Smith.

20 Q. And where do you live, Dr. Smith?

21 A. Washington, D.C.

22 Q. And as Mr. Goodstein indicated, you're an economist,
23 correct?

24 A. I am. I also have training in other areas.

25 Q. All right. And you have been retained by TVA as an

1 expert witness in this matter; is that correct?

2 **A.** I have been, yes.

3 **Q.** And have you authored two reports?

4 **A.** Yes. There's my original report from February 27th,
5 2007, and then my supplemental report from June 4th, 2007.

6 **MR. LANCASTER:** And at this point, Your Honor, I
7 should indicate that it might help if the witness and the
8 Court would have handy book 19, which contains the
9 exhibits that will be used with Dr. Smith. And it's on
10 the shelf behind you, Dr. Smith.

11 **THE COURT:** All right.

12 **Q.** (By Mr. Lancaster) And are exhibits 438 and 439
13 copies of the reports that you just described?

14 **A.** Yes, they are.

15 **Q.** What is your education?

16 **A.** I have a bachelor's degree in economics from Duke
17 University from 1977. I have two degrees from Stanford
18 University. I received a master of economics -- master of
19 arts and economics in 1981 and then received by Ph.D. in
20 economics, with a minor in engineering economic systems,
21 in 1984 from Stanford. The engineering economic systems
22 is the part that focused on risk analysis, risk
23 assessment, and systems optimization. So that's where the
24 additional trainings come from.

25 **Q.** Thank you.

1 Could you describe for the Court your work history?

2 A. Yes. From 1977 to 1979, I worked at the U.S.

3 Environmental Protection Agency in Washington, D.C., in
4 The Office of Policy Planning and Evaluation.

5 Following that, while I was getting my graduate
6 degree after that, I worked continuously in consulting
7 engagements, both for the USEPA and also for European
8 governments.

9 In 1985, I started -- oh, I'm sorry. In the middle
10 there, I worked also for SRI International part of the
11 time when I was in graduate school, and that was where I
12 worked in part -- part of time when I worked for the USEPA
13 under contract.

14 In 1985, I started work -- from 1985 until 1998, I
15 worked with a company called Decision Focus, Incorporated,
16 which later became Talus Solutions, Incorporated. And
17 then in 1990 and to the present, I have -- I am a vice
18 president with CRA International, which was formerly
19 called Charles River Associates.

20 Both at my previous employment at Decision Focus, and
21 now in my current employment, I've done work that's a
22 combination of helping businesses plan for environmental
23 compliance and other operational decisions and also
24 environmental risk analysis and other policy analysis
25 issues, mainly around environmental issues.

1 Q. And CRA is where you continue to work today?

2 A. Yes. I'm presently employed by CRA International.

3 Q. You mentioned your work for EPA early in your career.

4 Have you had other engagements outside your industry

5 client base other than for the Environmental Protection

6 Agency?

7 A. Yes, I have. All is consulting engagements through
8 my company arrangements. I've worked for the Grand Canyon
9 Visibility Transport Commission developing the integrated
10 assessment model that was used when that group developed
11 their analysis of the costs and impacts of regional haze
12 programs in the West.

13 I also worked in the National Acid Precipitation
14 Assessment Program's Office of the Director. I advised
15 the director on issues related to performing integrated
16 assessment, which is a sort of the confluence of
17 environmental risk analysis and cost-benefit analysis.

18 And I have worked for the U.S. Department of Energy,
19 performing risk analyses and cost analyses for the
20 clean-up of their -- of the U.S. nuclear weapons complex.

21 I worked for the U.S. Department of Agricultural in
22 the Food Safety and Inspection Service there, helping them
23 develop a risk-based priority setting scheme for their
24 contaminant, food-contaminant, sampling program in the
25 U.S.

1 And I worked for the Center for Clean Air Policy,
2 which is a non-profit organization interested in promoting
3 emissions trading. That was work related to the design of
4 efficient and equitable forms of greenhouse gas policy.

5 I've also done work over the years on a pro bono
6 basis -- well, I should go back. As far as governments
7 go, too, I've also worked for heads of agencies of the
8 Country of Mexico and the Netherlands on issues related to
9 environmental risk management.

10 I've also worked, as I said, on a pro bono basis on a
11 number of settings. I have done -- worked on several
12 different U.N. committees that were related to air and
13 water risk management issues. I have been on several
14 National Academy of Sciences committees on matters
15 relating to risk assessments and management of risks.

16 And I also have several times, multiple times,
17 testified before the U.S. Congress on a variety of
18 matters, twice on particulate matter risks, once on issues
19 related to the costs and impacts of regional haze, again,
20 that was in the West, and several times on designing
21 efficient policy mechanisms for reducing greenhouse gases.

22 Q. You mentioned fine particulate matter. The Court has
23 heard a good bit about that during the course of this
24 trial.

25 Can you identify some of the specific things that

1 you've done with regard to PM2.5, also known as fine
2 particulate matter?

3 **A.** Yes. Originally, the work with the Grand Canyon
4 Visibility Transport Commission back in the early '90s
5 involved, as I said, developing an integrated assessment
6 model for particulate matter and its effects on haze.
7 Visibility, specifically. So this involved a lot of work
8 with the modeling and the impacts associated with
9 particles. And that's where I got a lot of groundwork
10 around the science of particles, the physical science, and
11 the air chemistry and how it translates into impacts.

12 After that, in the early '90s, the USEPA started the
13 first of two rounds of particulate -- fine particulate
14 matter, evaluations of the risks associated with it, in
15 order to set the PM2.5 National Ambient Air Quality
16 Standards. And so I was drawn into that work sort of
17 relying on what I'd already learned in the science of the
18 PM2.5 to look at the health risks and the evidence related
19 to health risks.

20 In the course of that work, I did a fair amount of
21 analysis several times over, performing risk analyses for
22 public health impacts associated with PM2.5 that relied on
23 scientific evidence available, which is the body of the
24 epidemiological literature for the most part at this point
25 in time.

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1 In the course of that work, I attended just about
2 every single meeting of CASAC. That's the Clean Air
3 Science Advisory Committee to EPA that oversees the
4 deliberation process of EPA in setting the Ambient Air
5 Quality Standards. So I attended just about every one of
6 those in both of the two review cycles, the first one
7 being from about 1995 to '97, and then in the second
8 review cycle that's just been completed. That process
9 ended in 2006. So it was during those years from 2004 or
10 '5 to 2006 where I was actively engaged in that sort of
11 risk assessment for PM2.5 again.

12 In the interim, I served on EPA's Board of Scientific
13 Counselors in their deliberations on developing EPA's
14 research plan for dealing with, sort of, gaps in our
15 understanding about the risks associated with PM2.5.

16 **Q.** Okay. And, Dr. Smith, how would you describe your
17 field of expertise?

18 **A.** I'm sorry. Could you repeat that?

19 **Q.** How would you describe your field of expertise?

20 **A.** As I've said, I'm an economist and a decision
21 analyst. I specialize in those fields in the areas of
22 environmental risk assessment, which largely comes out of
23 the decision analysis side of the work, and I also deal
24 with issues related to cost-benefit analysis, which drops
25 out of the economics profession as part of -- from the

1 field of welfare economics.

2 I also mentioned the term "integrated assessment,"
3 which is sort of a nexus between the two, where both the
4 environmental risk assessment and the cost-benefit
5 analysis concepts are brought together, and that is most
6 commonly what's being done in a lot of these air policy
7 decision processes.

8 Q. Can you give an example or two of your training and
9 experience in risk assessment?

10 A. All right. Well, as I mentioned, I started my career
11 at USEPA back in the '70s, and I was first exposed to risk
12 assessment issues when I was working there on the decision
13 EPA had to make regarding whether to list inorganic
14 arsenic as a hazardous air pollutant. I was very
15 intrigued by the difficulties of making those risk-based
16 decisions and the tools -- the inadequacy of the tools in
17 risk assessment at the time.

18 When I went to graduate school at Stanford after
19 that, I, as I said, went in the economics department, but
20 I was very interested in trying to expand my understanding
21 of these issues and develop better tools to help with risk
22 assessment and risk management specifically for
23 environmental issues where there is such weak information
24 about the risk determinants. So I sought out many
25 seminars and coursework that was related to this, even

1 though it wasn't part of the standard economics department
2 curriculum. And there was a wealth of that at Stanford.
3 That's how I found my way to the engineering economics
4 systems department, because this was -- in a sense, this
5 was the material '80s, and Stanford University is sort of
6 a center of the development of decision analysis
7 techniques. But a lot of the methods of air quality risk
8 assessment kind of evolved out of people who had come out
9 of that department, and I was working with them and
10 getting a lot of exposure to the issue.

11 After my second year in the graduate program, I
12 took -- I essentially took a full-time job with SRI
13 International to try to get some applied experience around
14 this developing area of application of risk assessment to
15 air quality issues. And I did this because they had a
16 contract that they had just gotten to which I was assigned
17 and led the work on entirely with the USEPA to demonstrate
18 how to not only do risk assessment for an ambient air
19 pollutant but how to incorporate uncertainty into the
20 assessment of the risks that were associated with
21 alternative levels of an ambient air quality standard.

22 Now, in this case the application was done for carbon
23 monoxide. That was the pollutant of concern and going
24 through a review cycle at that time.

25 So I did this, you know, probabilistic risk assessment

1 for different levels of an ambient air pollutant. And
2 this was really the beginning of methods that are now
3 being applied over and over for each of the air
4 pollutants, including PM2.5.

5 So that was during graduate school. When I finished
6 graduate school, as I said, I joined Decision Focus,
7 Incorporated, which is a company that specialized in risk
8 assessment, and there I sort of extended my applications
9 of risk assessment beyond the air pollutants and into
10 issues like leaking underground storage tanks, air toxics,
11 nuclear waste, PCB contamination, even climate change,
12 which I continue to do.

13 And then, during that time -- that was in California.
14 During the time I was working in California, I was a
15 registered environmental assessor under the State of
16 California REA program.

17 About 1990, I moved back to Washington, D.C., and
18 from that time on I became more focused on air quality
19 risk analysis issues and policy analysis issues, and
20 that's much where I began.

21 **MR. LANCASTER:** Your Honor, defendant tenders
22 Dr. Smith as an expert in economics, decision analysis,
23 environmental risk assessment, and cost-benefit analysis.

24 **MR. GOODSTEIN:** Same objection, Your Honor.

25 Dr. Smith is an economist. We have no objection

1 to her testifying as an expert in economics. But she's
2 not a toxicologist or an epidemiologist or a public health
3 expert or a medical doctor, so we continue to maintain
4 that she's not qualified as an expert to testify in the
5 public health area.

6 And there are specific, discrete parts of her
7 report that we would object to, and that's pages 26 to 34
8 of Defendant's Exhibit 438, and pages 19 to 24 of
9 Defendant's Exhibit 439, as well as Defendant's Exhibit
10 441, 444, 446A, and 447A.

11 And what those portions of Dr. Smith's
12 disclosure report attempt to do is to provide a
13 methodology of determining a concentration response
14 function for PM2.5 mortality that is unreliable. It's
15 based on work that was done a number of years ago. It's
16 not based on a current review of the literature since
17 2005, and based on her qualifications and the flaws in her
18 methodology, North Carolina continues to maintain its
19 objection to that testimony.

20 Thank you, Your Honor.

21 **MR. LANCASTER:** Your Honor, if I could speak
22 briefly to that.

23 Dr. Smith performed a number of sensitivity
24 analyses to the cost-benefit calculation performed by
25 Dr. Deck, as she will describe.

1 She's laid a foundation for her expertise in
2 environmental risk assessment. She is not an
3 epidemiologist, a toxicologist, nor a medical doctor, just
4 like Dr. Levy is none of those things.

5 One of her calculations, the one Mr. Goodstein
6 refers to, was an examination of the effects of altering
7 the concentration response function that Dr. Levy used,
8 and the inputs that she used for that were all established
9 by Dr. Levy in his testimony.

10 For example, she looked at the implications of
11 using a 0.5 percent of coefficient in the formula instead
12 of a 1 percent coefficient, and Dr. Levy testified that
13 that's a coefficient that he has used frequently and is a
14 plausible alternative for performing the sensitivity
15 calculation that lays the foundation.

16 We would respectfully request that the Court
17 accept the tender of Dr. Smith.

18 **THE COURT:** All right. Let me take a look here
19 for a minute.

20 (**Pause in the proceedings.**)

21 **THE COURT:** I'm going to have to wait until I
22 hear the specifics to which the objection is aimed. So
23 let's just move the case along, and when an objection is
24 made, I'll take a careful look at it.

25 **MR. GOODSTEIN:** Thank you, Your Honor.

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1 **MR. LANCASTER:** Thank you, Your Honor.

2 We move for admission, Your Honor, of
3 Dr. Smith's expert report she previously identified, 438
4 and 439.

5 **MR. GOODSTEIN:** And our objection, Your Honor,
6 is to pages 26 to 34 of Defendant's 438, and 19 to 24 of
7 Defendant's 439.

8 **THE COURT:** 26 --

9 **MR. GOODSTEIN:** Pages 26 to 34 of Defendant's
10 438, and 19 to 24 of Defendant's 439.

11 **THE COURT:** All right. Sit back and relax while
12 a take a look at these.

13 (**Pause in the proceedings.**)

14 **THE COURT:** Have you had any publications,
15 Dr. Smith, dealing with this cost-benefit and risk
16 analysis and so forth that have been the subject of peer
17 review that you might call to my attention?

18 **THE WITNESS:** I don't know about publications
19 subject to peer review, but I have the carbon monoxide
20 study that I did for EPA. That is a report to EPA. It
21 was one of the first demonstrations of the use of expert
22 elicitation to develop estimates of risk for air pollutant
23 and air quality. And I have many reports that have been
24 submitted to CASAC, and so I guess it's to EPA, and
25 presented before CASAC, in, of course, rule makings.

1 The methods that I'm using are recognized as
2 normal methods for integrating the information that comes
3 from the epidemiology. But as far as publications
4 demonstrating the method in peer-reviewed format, I have
5 not done that. But the techniques that I am using are the
6 same techniques that have been in use in the field.

7 I should note that the expert elicitation was
8 developed out of the field of decision analysis, and the
9 early developers of the technique were consultants at SRI
10 International, which is where I did the carbon monoxide
11 risk assessment work. And, you know, since -- they also
12 were affiliated with the decision analysis department at
13 Stanford University and they were my faculty.

14 **THE COURT:** All right. I'm going to sustain the
15 objection to that portion of the testimony.

16 **MR. GOODSTEIN:** Thank you, Your Honor.

17 **MR. LANCASTER:** May we consider the decided
18 pages as a proffer of the excluded evidence for purposes
19 of the record on appeal?

20 **THE COURT:** Sure.

21 **MR. LANCASTER:** Thank you, Your Honor.

22 **BY MR. LANCASTER:**

23 **Q.** Now, Dr. Smith, have you examined the expert reports
24 and testimony -- and transcripts of the trial testimony of
25 plaintiff's witness, Dr. Deck?

1 **A.** Yes, I have.

2 **Q.** And in your opinion, are there methodological issues
3 about the way Dr. Deck performed a cost-benefit analysis
4 in this case?

5 **A.** Yes. There are three very significant concerns as
6 far as application of both cost-benefit analysis and
7 decision-making.

8 First, the analysis was done on an aggregate basis of
9 all the costs and all the benefits for the entire set of
10 prescribed projects control on the TVA system, and the
11 practice of decision-making and systems optimization
12 cost-benefit analysis would argue that those should be
13 disaggregated and individually considered.

14 Second, he considered the impacts in his analysis
15 beyond -- for benefits beyond the state of North Carolina,
16 and that's inconsistent with the underlying principles of
17 cost-benefit analysis.

18 And third, there is an enormous amount of uncertainty
19 in all of the inputs into this cost-benefit analysis, not
20 just the epidemiological portion. And none -- none of
21 that uncertainty was analyzed in a sensitivity analysis
22 form, which is also fundamentals of good practice.

23 **Q.** Let's talk about the first one of those. You
24 mentioned that Dr. Deck conducted what you called an
25 aggregated analysis.

1 Could you explain to the Court why that was not
2 methodologically proper?

3 A. Yes. The idea of cost-benefit analysis -- well,
4 first I should say the way Dr. Deck did his analysis is
5 Dr. Staudt identified a number of individual scrubber and
6 NOx control projects on various of the units. There were
7 15 such individual projects. And Dr. Deck looked at the
8 cost and benefits of the entire 15 as one aggregate set.
9 That is not really the way that cost-benefit analysis is
10 supposed to be applied in theory.

11 Cost-benefit analysis is a technique for identifying
12 sort of an optimal level of control, and underlying that
13 idea is, as you push to higher and higher levels of
14 control of pollutants, say, costs will be going up and
15 benefits will be going up. But because of the law of
16 diminishing returns, you can expect at some point, as you
17 push towards lower and lower levels of emissions, costs
18 will be escalating more rapidly than the benefits will be
19 adding up.

20 And the principal cost-benefit analysis is to find a
21 point at which the extra amount of control, say, the extra
22 project that you might engage in to reduce emissions
23 further, to push it up to the point where there is no --
24 where the amount of benefits that you would gain from that
25 extra project are less than the amount of -- well, that

1 the incremental benefits are equal to the incremental
2 costs. So the net benefits are just zeroed at that point
3 at that project.

4 When you get to that point, additional projects will
5 provide net negative benefits, and, therefore, that point
6 is the stopping point in the analysis.

7 This is sort of the fundamental theory of -- you
8 know, it's called, you know, optimization. And the idea
9 of a marginal equalization, marginal cost, and marginal
10 benefits is the principle in theory, but it's fundamental
11 to the practice.

12 And you can find, you know, evidence in all of the
13 guidance, both by EPA and practitioners of this on the
14 environmental side, also, OMB practitioners of
15 cost-benefit analysis across the entire federal
16 government, that you should be looking at alternative
17 levels of control, not just a single aggregate, perhaps,
18 ad hoc developed set of controls, but, instead, to break
19 it down to its parts and decide where is the point where
20 more control is not cost-benefit justified.

21 Dr. Deck, in his supplemental report and in his
22 testimony that I read the transcript of, tries to make
23 this look very complicated, but it's really just an
24 extremely simple point.

25 For instance, imagine that you have a financial

1 advisor, and the financial advisor comes to you and says,
2 I have two investment alternatives for you to think about
3 investing in.

4 Investment A is going to give you a net benefit of
5 \$4 million. So you invest a certain amount. At the end
6 of the day, you get back enough return that you have made
7 \$4 billion net. Investment B, you're going to lose a
8 million dollars.

9 Obviously, you wouldn't take investment B. In fact,
10 if your advisor suggested that you do so, you might think
11 he was nuts and you might fire him. But imagine if your
12 advisor -- you said to your advisor, Somebody suggested I
13 do these two investments; would you go away and please
14 come back to me and tell me if I should be making these
15 investments. And your advisor comes back to you and says,
16 Well, I've looked at them, and if you do these, you could
17 make \$3 million. That's the 4 million you can make on one
18 and the negative million that you would lose on the other.

19 Well, \$3 million for that package of investments
20 might sound like a good idea and you might do that.
21 However, if you don't ask the question, or if your advisor
22 doesn't tell you, well, in fact, underlying that is a
23 \$4 million gain and \$1 million loss, you would be not
24 doing as well and not maximizing your welfare as well as
25 you could if you just made the investment in investment A

1 and ignored the opportunity to invest in the second.

2 And that's exactly what is happening in the practical
3 application in this case. Dr. Deck has brought forward a
4 cost-benefit analysis that looks at 15 separate
5 investments, none of which has to be undertaken in order
6 for the other to be gained.

7 And while his own testimony shows that there is a
8 very marginal, slim margin, perhaps, or maybe there is a
9 gain or not a net gain for the whole package, what you
10 need to understand is there are winners and losers down
11 inside that set of 15 control options.

12 And so this is what I did, is I simply took his
13 analysis and disaggregated it according to the, sort of,
14 standard procedures that one would do.

15 Q. And when you disaggregated the analysis, you
16 determined that a number of the control projects that were
17 specified by Dr. Staudt and evaluated by Dr. Deck, in
18 fact, had cost-benefit ratios that did not justify them;
19 is that correct?

20 MR. GOODSTEIN: Objection to form.

21 THE COURT: Overruled.

22 THE WITNESS: I did the analysis. I did it by
23 using plant-by-plant specific control measures and
24 modeling of -- modeling of the individual plant's
25 contribution to the air quality. When you add it all up,

1 I can reproduce his total aggregate number, I can
2 reproduce the total benefits, and I can reproduce the
3 total costs, but I also have the ability to see the
4 individual 15 net benefit statements and cost-benefit
5 ratios. And when I do that, I find that, even using all
6 of his assumptions that he used, there are only four
7 control measures, and they are FGDs, that pass the cost
8 benefit, that would provide net positive benefits. And
9 one of them -- there's another one that is marginal. It's
10 right on the borderline. It's a slight negative net
11 benefit. And all the rest, which includes all of the NOx
12 control measures, as well as several of the FGD measures,
13 have negative net benefits, and they are like the bad
14 investment in my example, the one that would lose a
15 million dollars. They both would lose multiple millions
16 of dollars.

17 **BY MR. LANCASTER:**

18 Q. When you disaggregated the control projects that were
19 specified, what were the projects that went to the top of
20 the list in terms of cost-benefit justification?

21 A. Can I put up the exhibit that's got Table F-2 --

22 Q. You may do that.

23 A. -- from my testimony? It's Exhibit 443.

24 What you see in this exhibit is the break-out that I
25 just described. At the bottom -- on the bottom row is the

1 combined of all projects. And this is -- this is sort of
2 the package, looking at it as an aggregate whole.

3 You can see, when you combine all the 15 projects
4 that are in the rows above -- this is a summation down
5 here at the bottom -- that they produce -- using all the
6 plaintiff's assumptions consistent with Dr. Deck's
7 supplemental report, so that he's using not his original
8 cost numbers but the revised numbers that Dr. Staudt
9 provided, I can produce the -- over -- almost -- about
10 \$630 million of benefits and an approximate \$700 million
11 in cost, and that produces a benefit-cost ratio that's a
12 little less than one, about .89.

13 What you can see, what makes up that .89, however, is
14 that at the top are the measures that produce a net
15 positive benefit, or that's alternatively seen as a
16 benefit-cost ratio that's greater than one.

17 Benefit-cost ratio is greater than one when benefits
18 are greater than the cost. It's less than one when
19 benefits are less than the cost. So all the benefit-cost
20 ratios on this table that are above one, you'll see just
21 to the left the dollar amount of the net benefit, and
22 they're always positive then. And for all of the
23 benefit-cost ratios which are less than one, which are the
24 lower part of the table, you can see that the net benefits
25 in dollar amounts are negative.

1 What you see here then is John Sevier -- the FGD at
2 John Sevier, the scrubber, that is, and the scrubber at
3 Bull Run, and the scrubber at Kingston pass the
4 cost-benefit test with ratios of two.

5 The scrubber at Johnsonville, with this set of
6 assumptions, is just on the margin, as is Widows Creek,
7 which is just under the margin. If you were to just do
8 the first four on that list you could see that the net
9 benefits that you would gain for that set of four would be
10 92 million, plus 43 million, plus 79 million, plus
11 7 million, which is -- see if I can do my math sitting on
12 the stand -- about 200, a little over \$200 million net
13 benefits positive.

14 But if you do any of the additional ones below
15 that, any of the other FGDs that I have not named, or any
16 of the SCRs, they'll drag that 200 and some million down
17 progressively so that you're losing more and more money,
18 and, eventually, you're at a point where you're at a net
19 loss.

20 But whether it goes negative on the bottom
21 there -- you'll see a negative 76 million for the whole
22 set. Whether it goes negative or remains positive, the
23 active undertaking of any of those bad investments there
24 among the rows below the fourth FGD down is simply to be
25 dragging down the potential social welfare from these

1 actions.

2 Otherwise stated, those individual projects that
3 have benefit-cost ratios less than one don't pass the
4 cost-benefit test for deciding whether they are -- if a
5 cost-benefit test is being used to decide whether
6 emissions are creating a nuisance in North Carolina, they
7 don't pass it.

8 **Q.** And to be clear, Dr. Smith, this particular Exhibit
9 443 only analyzes the benefits to North Carolina; is that
10 correct?

11 **A.** That's correct.

12 **Q.** And you indicated, your second point about Dr. Deck's
13 methodology was that you believed it was improper for him
14 to include benefits outside of North Carolina.

15 Could you explain to the Court briefly why that is?

16 **A.** Okay. Well, to understand it, you have to go to the
17 theoretical underpinnings of cost-benefit analysis and why
18 it's viewed as a good tool for directing social welfare,
19 to try to improve social welfare.

20 Cost-benefit analysis works by adding up all the
21 costs, adding up all the benefits, comparing them, and
22 deciding if we have a positive net benefit, much as we're
23 doing on this table.

24 The problem with cost-benefit analysis is that any
25 policy that might create costs and benefits is going to

1 create some winners and some losers. It almost always
2 does. And so that may be viewed -- some policies that
3 have net policy benefits may be viewed as unfair and,
4 therefore, not desirable as a social matter, even though
5 they have net positive benefits.

6 There is a principle underlying why it is it's still
7 viewed acceptable to use cost-benefit analysis and proceed
8 forward as a decision-making tool to help guide
9 policymakers towards social welfare improvements, and this
10 is called the potential compensation principle.

11 Technically, if you're reading economics texts, you might
12 see it, or you're more likely to see it called the
13 potential PARETO improvement.

14 Q. Is that P-A-R-E-T-O?

15 A. Capital P-A-R-E-T-O. Now, that's just the technical
16 term. And often it's called the potential compensation
17 principle. Either way, it's the same principle. And what
18 it's saying is that there is -- if you have positive net
19 benefits overall in this -- coming from this policy, there
20 is some way for that policymaker, even if it's not that
21 policy itself, but through other authorities, to
22 redistribute some of those benefits so that those who are
23 in a losing side of the equation are actually compensated
24 and made better off.

25 So when net benefits are positive, there is a

1 potential for the policymaker to find a way to make
2 everybody at least better off and nobody worse off. And
3 then, clearly, that is a social improvement, if at least
4 some people are better off and nobody is worse off.

5 So the potential PARETO improvement, or the potential
6 compensation principle, is fundamental to this ability to
7 use cost-benefit analysis as a way of saying is this a
8 good policy decision or not. But it also is assuming --
9 what it's doing implicitly is assuming that the very
10 policymaker who is deciding whether or not to push the
11 policy forward, that will create cost and benefits, also
12 has the authority or wherewithal, political power or the
13 extent of jurisdiction, to be able to actually take some
14 of those benefits and, by some other means, perhaps, under
15 his purview, to effectuate that potential compensation and
16 make it an actual one so it really is a better policy for
17 that society.

18 But that's why, when the policymaker is doing a
19 cost-benefit analysis, he should limit the benefits that
20 he's considering only to those that are sort of accruing
21 to his own constituents, because those are the only ones
22 that he has a potential to actually use to make a
23 potential compensation be an actual one.

24 So if a cost-benefit test cannot be passed on the
25 basis of considering only those benefits that accrue to

1 the constituents under the jurisdiction of that
2 policymaker, then the PARETO improvement criterion, or the
3 compensation principle, has been violated if you can't
4 pass the test on that narrowly-defined set of benefits,
5 and that undermines and destroys the ability to say that
6 the cost-benefit analysis is actually able to point you in
7 the direction of good social policies.

8 Q. Dr. Smith, is there any regulatory guidance that
9 provides a practical example of what you're talking about?

10 A. Yes. This is -- actually both the EPA guidance on
11 doing cost-benefit analysis and the OMB guidance on doing
12 cost-benefit analysis states that the scope of benefits
13 should be -- I think that the OMB guidance says that those
14 which accrue to the citizens of the United States.

15 In other words, when a federal rule is being applied,
16 we don't count -- the USEPA doesn't count benefits in
17 Canada and Mexico to do the cost-benefit evaluation of
18 that federal policy. They look only within the U.S. And
19 so it's really standard practice to narrow the benefits
20 down to just those that are accruing to the constituents
21 and the policymaker, and if you don't do that, you're
22 violating the principles of the cost-benefit analysis,
23 theoretically, a viable social welfare enhancing tool.

24 Q. Dr. Smith, the third point you raised was Dr. Deck
25 performed no sensitivity analysis in the uncertainties in

1 the assumptions he relied on. Could you explain that to
2 the Court?

3 **A.** Yes. Also, in all of these guidances, and
4 fundamental to the practice of decision-making under
5 uncertainty, is that when there are substantial
6 uncertainties underlying one's decision analysis or an
7 assessment, cost-benefit analysis or assessment of
8 alternative options for action, that you should evaluate
9 what the impact of those uncertainties might be on the
10 decision, and not to use a point estimate that is your
11 best judgment, if you will, of the right values, but to,
12 in fact, say, well, let's recognize that there is a
13 plausible range of uncertainty on certain of my input
14 assumptions and do a sensitivity analysis of whether I
15 would actually still want to make that decision if it's
16 warranted under my best judgments; if I -- would I still
17 want to make that decision if those assumptions vary
18 within that plausible range of uncertainty.

19 That's a minimum if this -- when there is a
20 significant policy decision, a lot of money at risk and,
21 clearly, sensitivities are very significant, then the
22 appropriate next step would be to go to a full uncertainty
23 analysis, probabilistic uncertainty analysis. But the
24 minimum standard of practice is to do a sensitivity
25 analysis at least.

1 Q. And did you -- and we still have Exhibit 443 on the
2 screen, which is the starting point, as I understand it.

3 Did you examine the sensitivity of these results to
4 Dr. Deck's assumption about the valuation of a statistical
5 life?

6 A. Yes, I did. Looking at the range of value
7 statistical-wise that is considered sort of the reasonable
8 and likely plausible range, I find that if I just simply
9 change that one assumption toward the value that I
10 consider within that plausible range and more towards the
11 center of it, it would be that all of the -- all of the
12 cost -- all of these projects lose their positive net
13 benefits except for the John Sevier FGD, and that remains
14 at a cost estimation of about 1.3.

15 Q. So after you examined the sensitivity of the
16 disaggregated list of projects to the valuation chosen for
17 statistical life, at that point only the John Sevier
18 scrubber project continued to be justified?

19 A. That's right. So what that says, if you are thinking
20 of investing in the Bull Run and Kingston FGDs on the
21 basis of the table we have in front of us, with that set
22 of assumptions, you need to know that there is uncertainty
23 as to whether those investments would produce net benefits
24 that are positive. They may also have negative net
25 benefits within that range of uncertainty, which means

1 that they should affect your evaluation of the decision.

2 Q. Now, as we've been discussing and as I believe most
3 of plaintiff's witnesses have testified, there are
4 uncertainties in the various assumptions that went into
5 this analysis. Is there some way to do a cost-benefit
6 analysis that does away with the need to make choices
7 between those uncertain inputs?

8 A. Yes, there is. It's a comparative cost-benefit
9 analysis. This is what I would call an absolute
10 cost-benefit analysis, where you're estimating an absolute
11 dollar amount of what it produces in the way of value.

12 And obviously, as we've just shown, that's really
13 very sensitive to even just one assumption, but it's
14 extremely sensitive to all of the assumptions that have
15 gone into this analysis.

16 If you -- the way you can do a comparative
17 cost-benefit analysis is that we step back and we say,
18 well, North Carolina, when it established the Clean
19 Smokestacks Act, it implicitly set a standard, a
20 cost-benefit cutoff for itself, and it did that by setting
21 the emissions levels under the Clean Smokestacks Act cap
22 at a level where -- at a point that did not require full
23 control on every plant in North Carolina, every power
24 plant in North Carolina. So while a majority of the power
25 plants in North Carolina are going to be controlled under

1 the Clean Smokestacks Act cap, several will not.

2 And so what we can do is say what is the implicit
3 cost-benefit standard that North Carolina has established
4 for itself by setting the cap at a level where certain of
5 the plants will be controlled and other plants will not.
6 And if we can find a break-even line where the
7 benefit-cost ratio -- using whatever set of assumptions
8 but using a consistent set -- where the benefit-cost ratio
9 comes down, down, down, until you stop controlling plants,
10 and then for the remaining plants that aren't going to be
11 controlled, that they, in fact, have a lower benefit-cost
12 ratio.

13 So somewhere between those -- the last plant
14 controlled has the lowest benefit-cost ratio of the
15 controlled set and the next one that isn't being
16 controlled tells you an implicit standard has been set.
17 And what is useful about this is, first, it's not at all
18 sensitive, the results that you conclude from this are not
19 at all sensitive to those assumptions you want to use in
20 the cost-benefit analysis. All that matters is you use
21 the same consistent set of assumptions for any application
22 of it to all the plants.

23 The other useful feature of it is, if you're
24 considering whether to ask for additional controls on
25 other plants, if those additional controls fall below that

1 break-even line that we can back out, that North Carolina
2 has revealed to us through its own decisions on controls,
3 if it falls below that break-even line on a benefit-cost
4 ratio, then it's requiring a higher standard for that one
5 to be controlled if North Carolina isn't requiring its own
6 plants to be controlled at that level of benefit-cost.

7 The exhibit here, Exhibit No. 447, comes from my
8 testimony. Its portion -- sorry -- from my report, my
9 first report of February. And it is Figure 3B. I'm just
10 looking at the bottom panel of that figure at this moment.

11 This figure was done using all of the plaintiff's
12 assumptions except for the cost. So it's consistent with
13 Dr. Deck's summary number of about, you know, .95.; .89
14 on my table.

15 But let me explain what's on this figure.

16 What I did to conduct -- in order conduct this
17 comparative cost-benefit analysis, I have to get the
18 benefit-cost ratios for all of the controls on the North
19 Carolina plants.

20 I've already gone through how I did them for the TVA
21 plant. But what I needed to do to do this test to get
22 North Carolina's implicit cost-benefit break point was to
23 do the same disaggregation of benefits and costs for each
24 individual plant that's of the North Carolina set.

25 Now, the bars on here that are dark red and yellow

1 are the North Carolina plants and they are the
2 benefit-cost ratios that I backed out for each of the
3 North Carolina plants from the data on what their costs to
4 control will be and what their emissions are and how they
5 affect North Carolina citizens in terms of risk, again
6 using all of the plaintiff's mortality and
7 willingness-to-pay assumptions.

8 The red lines, the red bars, the first three are red
9 and then yellow and three more that are red. Those red
10 bars are benefit-cost ratios that I estimated for each of
11 the North Carolina plants that will be getting an FGD or
12 scrubber under the Clean Smokestacks Act. This is
13 according to the North Carolina plan and data taken
14 straight from the North Carolina -- the reports that the
15 companies need to produce for what their plans are to
16 comply with CSA.

17 And you can see that they sort of start from a high
18 of 7 benefit-cost ratio and fall down to a low of just
19 under 3.

20 The yellow bars are the benefit-cost ratios, if I
21 were to -- if someone were to prescribe an FGD on the
22 remaining plants in North Carolina. So these yellow and
23 the red are both North Carolina plants. But the yellow
24 ones are the scrubbers that aren't happening, the control
25 projects for SO₂ that are not happening.

1 And what's interesting to see is, other than the
2 anomaly for River Bend, we find that all the controls --
3 all the plants that are being controlled have benefit-cost
4 ratios down to about, looks like about 3.5 here, somewhere
5 just under 3, and then four of the five plants that North
6 Carolina sort of drew the line on and said, we're not
7 going to tighten the cap so much, but these need to be
8 scrubbed, have lower benefit-cost ratios, and the break
9 point is going to be somewhere in there between L.V.
10 Sutton and the Lee plant, where the L.V. Sutton is the
11 last, you know, the lowest benefit-cost ratio that's being
12 required under CSA, and the Lee plant is the highest of
13 the potential benefit-cost ratios of FGDs that are not
14 going to be required in North Carolina.

15 So the break-even point is somewhere there between
16 about two and a half and three and a half it looks like.

17 That's sort of a revealed preference, if you will, of
18 North Carolina. It isn't a benefit -- they didn't cut it
19 at a benefit-cost ratio of one; they cut it somewhere
20 higher, which may suggest that they don't actually adhere
21 to the same assumptions that the plaintiffs are using for
22 their benefit-cost analysis. But be that as it may, we
23 don't need to worry whether it's right or wrong.

24 What we can do now is say, comparatively speaking,
25 what is the benefit-cost ratio that TVA controls? How do

1 they match against this implicit standard that North
2 Carolina has set for itself? And what you see -- those
3 are the blue bars. These are the TVA control measures.
4 These are -- the height of these bars are the values of
5 benefit-cost ratios that were in the preceding exhibit,
6 which was labeled Exhibit 443. And what you see is the
7 left most of the blue bars is John Sevier, and it's up
8 there with a benefit-cost ratio that's above the standard
9 that North Carolina has implicitly set for itself. But
10 all of the rest of the blue bars, starting with Bull Run
11 and Kingston, and going on down to Allen, fall in the
12 range below that break-even line that is the implicit
13 North Carolina benefit-cost standard.

14 Now, Bull Run and Kingston kind of fall in the
15 middle. They have benefit-cost ratios that are not
16 dissimilar from those of the remaining plants that could
17 be controlled in North Carolina. But, nevertheless, since
18 those are not being controlled, even those two plants at
19 Bull Run and Kingston, those two FGD projects fall below
20 and at a tighter standard, if you will, than North
21 Carolina has implicitly set for itself.

22 And then in order to justify controls at
23 Johnsonville, at Widows Creek, Colbert, Galax, Shawnee,
24 and Allen, according to an implicit North Carolina
25 standard, in order to say that they would be comparable,

1 we would have to first see those yellow bars become
2 controlled. We'd have to first see additional controls
3 going on in North Carolina, because those have higher
4 benefit-cost ratios than if the TVA controls would.

5 The reason for this -- you notice, of course, the
6 TVA, the blue bars tend to fall to the right-hand side of
7 the chart here, meaning they tend to have lower
8 benefit-cost ratios than controls applied within North
9 Carolina.

10 Well, the reason for that is really very simple.
11 It's just that these plants are at a distance from the
12 North Carolina terrain, and so they produce -- for a given
13 ton reduce, and even for a given dollar spent to reduce
14 emission of that ton, they produce fewer benefits. And so
15 this also explains why you see John Sevier and Bull Run
16 and Kingston as being the ones that are most, sort of,
17 comparable to controls that could be done within North
18 Carolina in terms of benefit-cost ratios. They are the
19 closest to North Carolina.

20 Q. You mentioned something about being the closest. Why
21 does that matter?

22 A. Well, as air pollution goes out of a stack as some
23 form of emissions, SO₂ or NO_x, it dissipates in the
24 atmosphere, so the further you get from a plant the more
25 the -- the faster the -- at a distance from the plant, the

1 contribution to the air quality in the region from that
2 plant drops off, and it drops off in a very non-linear
3 fashion. So most of the gains from reducing pollution
4 occur within -- you can see in my report that it occurs
5 within about 200 -- I'm not sure if it's miles or
6 kilometers. Look at the figure here in my first report.
7 It's Figure 4 in my first report. There's several of
8 them. It's within the first 200 kilometers. That's where
9 most of the impact occurs, according to these atmospheric
10 modeling exercises.

11 And since our atmospheric models, what I was using
12 for this analysis, reproduces the benefits that the
13 plaintiff's atmospheric model was using, there's really
14 not going to be any big difference in that conclusion.
15 They're coming to the same conclusions on air quality as
16 far as benefit-cost ratios go.

17 Q. Dr. Smith, what is your cost -- what does your
18 comparative cost-benefit analysis say about any request by
19 North Carolina for TVA to add scrubbers on its plant
20 besides the scrubbers it is already putting on Bull Run,
21 Kingston, and John Sevier?

22 A. It implies that to require those scrubbers would be
23 imposing a higher standard than North Carolina has imposed
24 on itself.

25 MR. LANCASTER: Your Honor, we move for the

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1 admission of Exhibits 443 and 447.

2 **MR. GOODSTEIN:** Your Honor, we have an objection
3 to 447A that Your Honor sustained.

THE COURT: Yes. 447 and 443 are admitted.

5 (Defendant's Exhibits 443 and 447
6 received in evidence.)

7 **MR. LANCASTER:** We have no further questions for
8 Dr. Smith.

CROSS EXAMINATION

10 | BY MR. GOODSTEIN:

11 Q. Good afternoon, Dr. Smith.

12 A. Good afternoon.

13 Q. I have a few questions for you on behalf of North
14 Carolina.

15 Firstly, just a little bit on your background and
16 experience.

17 You've done quite a bit of work for the Electric
18 Power Research Group. Isn't that true?

19 A. Electric Power Research Institute.

20 Q. Institute? And the Utility Air Regulatory Group?

21 | A. That's right.

22 Q. Is that correct?

23 And you've also got a number of projects listed for
24 confidential electric companies and confidential power
25 companies. Isn't that true?

1 **A.** Are we talking about PM2.5 specifically or just --
2 **Q.** We're just talking about projects you have listed on
3 your CV.
4 **A.** That's true.
5 **Q.** And all the analyses that you've presented in your
6 report and that you presented here today only look at
7 benefits in North Carolina. Isn't that true?
8 **A.** Yes.

9 **MR. GOODSTEIN:** Can we put up Plaintiff's
10 Exhibit 135, please, on the monitor.

11 **Q.** (By Mr. Goodstein) The modeling, the air dispersion
12 modeling that you relied on, Dr. Smith, is the air
13 dispersion modeling that was done by Dr. Tesche; is that
14 correct?

15 **A.** Yes, it was; although I was relying on the CAMX
16 model.

17 **Q.** So, in particular, Dr. Tesche's -- well, from the
18 Tesche and Mueller report, in particular, you were relying
19 on the 2002 CAMX modeling runs; is that correct?

20 **A.** That's right.

21 **Q.** And do you know whether the modeling domain for the
22 CAMX runs was the same as the modeling domain you see
23 before you for the CMAQ runs, Plaintiff's Exhibit 135?

24 **A.** I don't know exactly what the domains are. They have
25 similar domains. The important thing is that I reproduced

1 exactly -- out of the 98 deaths that were produced for
2 using the CMAQ on the plaintiff's side, I came up with 96
3 deaths when using the CAMX and building up separately and
4 using all the same assumptions.

5 So we get the same answer. It doesn't suggest that
6 any differences in the modeling domain could really
7 explain significant differences in my results.

8 **Q.** Okay. Now, I'm going to ask you my question, okay?

9 The modeling results that you've looked at included
10 projections of air quality changes throughout the modeling
11 domain. Isn't that true?

12 **A.** They included. I didn't actually look at the
13 projections in other areas than North Carolina and
14 Tennessee.

15 **Q.** But it did include that; is that true?

16 **A.** Actually, only in North Carolina.

17 Yes, they produced those results.

18 **Q.** And you would expect there to be air quality changes
19 in states, for example, Tennessee, Alabama, and Kentucky
20 where TVA's plants are located --

21 **A.** Yes.

22 **Q.** -- wouldn't you?

23 Okay. But you didn't consider any benefits
24 associated with those air quality changes in your
25 analysis, correct?

1 **A.** Because of the reason I gave, which is that it's a
2 flaw to consider them, unless it's a federal program,
3 where consideration of all the states would be very valid
4 to consider if this were a federal decision.

5 **Q.** So you answered my question in the affirmative, I
6 think, right?

7 **A.** I did not.

8 **Q.** You didn't consider benefits in Tennessee, Alabama,
9 and Kentucky?

10 **A.** I did not estimate them, no.

11 **Q.** Or in any other state in a domain other than North
12 Carolina, correct?

13 **A.** No, I did not.

14 **Q.** You have provided in your report and you've testified
15 here today that your conclusions in this case are based
16 on, rely on, this OMB Circular A-4, correct?

17 **A.** I use it as evidence of standard guidance, yes.

18 **MR. GOODSTEIN:** Your Honor, if I could approach,
19 I have a copy of an excerpt from that Circular A-4.

20 **THE COURT:** All right.

21 **Q.** (By Mr. Goodstein) Dr. Smith, I'm showing you what's
22 been marked as Plaintiff's Exhibit 546 for identification.
23 And is this an excerpt from Circular A-4, which is the
24 Office of Management and Budget guidance --

25 **A.** Yes, it is.

1 Q. -- that you referred to in your report and that you
2 referred to in your testimony?

3 A. Yes, it is.

4 MR. GOODSTEIN: We offer Plaintiff's Exhibit 546
5 into evidence at this time, Your Honor.

6 MR. LANCASTER: Objection on the grounds that
7 it's incomplete.

8 THE COURT: Overruled.

9 (Plaintiff's Exhibit 546 previously received.)

10 BY MR. GOODSTEIN:

11 Q. So, in accordance with this Circular A-4, Dr. Smith,
12 you would agree that regulatory analysis is a tool
13 regulatory agencies use to anticipate and evaluate the
14 likely consequences of rules. Isn't that true?

15 A. That's right.

16 Q. And one of the primary motivations for regulatory
17 analysis is to learn if the benefits of an action are
18 likely to justify the costs. Isn't that true?

19 A. That's true. Are you quoting, by the way?

20 Q. I am.

21 A. I mean, it's true, but I just don't know if I'm
22 supposed to be reading along beside you.

23 Q. All right. No. If you agree with me, you can just
24 agree with me. If we have to look at the specific
25 language, I will direct you to it.

1 And then this guidance also provides, on page 15 --
2 and I believe you cited some of this language earlier;
3 this is at the top of page 15 -- that your analysis --
4 "Your analysis should focus on benefits and costs that
5 accrue to citizens and residents of the United States.
6 Where you choose to evaluate a regulation that is likely
7 to have effects beyond the borders of the United States,
8 these effects should be reported separately. "

9 Do you agree with that?

10 A. I agree with that. If you choose to, these would be
11 recorded separately.

12 Q. And then turning your attention back to page 14 --
13 this is in the second paragraph under "Distributional
14 Effects."

15 This guidance provides that the regulatory analysis
16 should provide a separate description of distributional
17 effects, that is, how both benefits and costs are
18 distributed among sub-populations of particular concern so
19 that decision makers can properly consider them along with
20 the effects on economic efficiency.

21 And you would agree with that, too, wouldn't you?

22 A. I do. Although that doesn't speak to the question of
23 what jurisdiction and whether those should be your
24 constituents that the policymakers should be considering
25 or not, which was my point about the PARETO improvement

1 principle.

2 Q. But for all the benefits that you presented and
3 analyzed in your report, you just considered benefits in
4 North Carolina. Isn't that true?

5 A. For the cost-benefit analysis part, yes.

6 Q. Isn't it also correct, Dr. Smith, that you did not
7 consider any of the non-monetized benefits that were
8 identified by Dr. Deck in his report? Isn't that true?

9 A. I didn't quantify them but I did consider them.

10 Q. But you didn't include them in any of the summary
11 tables that you presented in your testimony today, did
12 you?

13 A. Because I was commenting on a specific part of what
14 Dr. Deck had produced.

15 I didn't debate the list of unquantified benefits,
16 but I did consider them as to whether they could be
17 significant enough to alter the benefit-cost ratios that
18 were being calculated. And I decided that they are not
19 large enough because the mortality estimates dominating
20 any of the estimates -- no matter whether you look across
21 multiple states or within North Carolina, it's all
22 dominated by mortality and --

23 Q. So you --

24 A. -- the benefits would have to be, from these
25 non-quantified parts, would have to be something like

1 equal in size to the benefits that are not -- that are
2 quantified. They'd have to be equal to the mortality
3 benefits in magnitude in order have much of a difference,
4 in order to be sensitive.

5 Q. So you didn't consider, for example, visibility
6 impacts or acidification impacts; is that correct?

7 A. I did consider them. I didn't write about them, but
8 I did consider them in the same manner that I just
9 discussed.

10 For instance, what I considered is that in, for
11 instance -- well, any other regulatory impact analysis
12 that's been done that has involved both the visibility
13 calculations and the mortality calculations, the
14 visibility benefits are somewhere between 1 and 3 percent
15 of the mortality benefits. One to 3 percent, if I added
16 that on, first of all, they would have to be added on
17 mainly to the John Sevier and Kingston and Bull Run
18 plants, because those are the ones that have the sulfur
19 dioxide that is closest and will come into the area where
20 the visibility issues are of concern around the
21 Appalachians.

22 So I've already said that those are the benefit-cost
23 ratios that are the most likely to pass a cost-benefit
24 test.

25 I did actually do some back-of-the-envelope

1 calculations that I did not describe in my report, and it
2 didn't make any difference to the -- I couldn't even see
3 the change in the second decimal place of the benefit-cost
4 ratio.

5 Q. Okay. So did you say that you did not describe that
6 calculation in your report? I believe that's what you
7 just said; is that right?

8 A. Yes, but I did consider it.

9 Q. Okay. So let's look at page 27 of the guidance from
10 OMB that you relied on in your work here. And I'm sure
11 you would agree with the first sentence of the paragraph
12 in the middle of the page under Benefits and Costs That
13 Are Difficult To Quantify.

14 "If you are not able to quantify the effects, you
15 should present any relevant quantitative information along
16 with a description of the unquantified effects, such as
17 ecological gains, improvements in quality of life and
18 aesthetics."

19 A. Yes.

20 Q. You agree with that, right?

21 A. I agree with it, and I believe it was done, because
22 Dr. Deck did that.

23 Q. But you didn't present any such analysis in your
24 report, correct?

25 A. I was responding to a specific portion of what

1 Dr. Deck presented.

2 Q. And this circular also goes on to say -- well, I'm
3 quoting from page 10 now. It should be also included in
4 this excerpt. "Even when a benefit or cost cannot be
5 expressed in monetary units, you should still try to
6 measure it in terms of its physical units."

7 Isn't that correct? That's what the guidance says,
8 correct?

9 A. Yes. But this has been done, as I understand it, by
10 Dr. Tombach. That was my understanding.

11 Q. But this is the circular that you rely on in your
12 work in this case, correct?

13 A. As I said, I was commenting on the application as it
14 was done by Dr. Deck and showing the very different
15 conclusions one can draw from his analysis. This would
16 not change those conclusions.

17 Q. Okay. Can we put up Defendant's Exhibit 440, please.

18 And this is a summary out of your report, Dr. Smith?

19 A. It is, but Table F-2 has replaced this, because
20 Dr. Deck -- this relies on Dr. Staudt's \$3 billion
21 estimate of costs, and as I understand it from the record,
22 that's no longer what's in place.

23 Yes. This was from my report. When I presented F-2,
24 that was the replacement for this that was consistent with
25 Dr. Deck's current starting point.

1 Q. Now, Dr. Deck, in his supplemental report, letter
2 report, presented the range of cost estimates in this
3 case. Isn't that true?

4 A. Yes.

5 Q. So they went from approximately \$516 million per year
6 analyzed to approximately \$718 million per year analyzed,
7 and the 718 was based on TVA's cost estimates, correct?

8 A. Correct.

9 Q. And the 516 was based on Dr. Staudt's cost estimates?

10 A. The original ones.

11 Q. All right. Are you aware that none of those cost
12 estimates took into account the fuel savings costs that
13 TVA might enjoy as a result of additional scrubbed units
14 in their system? Are you aware of that?

15 A. I'll only say that I've heard word of the fuel
16 savings costs, but I haven't seen any material on it.

17 Q. Okay. So referring back to this table we have in
18 front of us out of your report -- this is Defendant's --
19 I'm sorry. It's from page 16 of your report, Defendant's
20 Exhibit 440.

21 Even with the assumptions that you made about only
22 considering benefits in North Carolina and not considering
23 other non-monetized benefits, isn't it true that you found
24 not only the John Sevier scrubber and SCR projects to be
25 cost-effective, but also the Bull Run scrubber, the

1 Kingston scrubber, Johnsonville scrubber, on all units at
2 Johnsonville, and scrubbers on Widows Creek 1 to 6? Isn't
3 that true?

4 A. Using Dr. Staudt's original cost assumptions, as I
5 said.

6 Q. Yes? The answer is yes?

7 A. Using Dr. Staudt's original cost assumptions.

8 Q. All right. And you attempted to do a marginal
9 benefit-cost analysis; is that correct?

10 A. No. I did a disaggregated incremental cost-benefit
11 test. I took the first most critical step in that
12 direction, which is to take the entire package and ask,
13 since these are separable, independent investment
14 decisions, which ones of them should be done and where is
15 the stopping point.

16 Q. Okay. So the description that you provided in your
17 direct testimony about an optimizing marginal benefit-cost
18 analysis, that's not really what you did here, correct?

19 A. This is the first step towards it and it makes a huge
20 difference.

21 Q. Okay. But you haven't done a full optimizing
22 marginal benefit-cost... (inaudible) --

23 A. I could go through --

24 (Interrupted by the court reporter.)

25 Q. Okay. So you didn't go unit by unit and look at the

1 use of fuel switching potentially, for example, or load
2 shifting, or SNCRs versus SCRs, or potential upgrading of
3 existing scrubbers at every unit, that sort of thing?

4 A. I did some of that.

5 Q. But you didn't do a full optimizing --

6 A. Not for every one.

7 Q. -- full benefit-cost analysis, correct?

8 A. If I were to do it, it would probably -- since some
9 of the FGDs pass the cost-benefit test, if you do that,
10 you might find that something less than a full FGD would
11 pass the cost-benefit test. There is really not much more
12 you can do beyond that. So the only direction you can go
13 is to lesser control. I didn't go as far as saying, Well,
14 the FGD passes the cost-benefit test, but, in fact, it
15 wouldn't if we were to do fuel switching. However, fuel
16 switching is already in the analysis because the fuel
17 switching for SO₂ has really already occurred on the TVA
18 system and is in the estimates in Table F-2.

19 Q. But you didn't --

20 A. But I did do that also -- I'm sorry. I did actually
21 do that for the SCR project at John Sevier, which, on the
22 table you just had up, had a 1.01, I think, relative --
23 benefit-cost ratio. And I did actually do that. It's in
24 my supplemental report.

25 So if you look again at this, if you go down the row,

1 the John Sevier SCR project has a benefit-cost ratio of
2 1.01.

3 That's very marginal. When you're that close to the
4 margin, the next step towards the marginal -- when I said
5 "marginal" there, I meant it's very close to the edge.
6 It's 1.01. And 1.00 is like just breaking even.

7 So when you see that, then the question is, is that
8 too much. So at that plant, we drilled down and we found
9 that, in fact, the SCR applied above and above an SNCR was
10 not cost effective, did not have a positive benefit-cost
11 ratio greater than 1. The SNCR had greater net benefits.

12 That's in my supplemental report.

13 Q. The circular, the OMB circular that you refer to, it
14 says in there that you need to balance the thoroughness
15 with the practical limits on your analytical capabilities.

16 Would you agree with that?

17 A. Yes.

18 Q. And it also says your analysis does not have to be
19 exhaustive, nor is it necessary to evaluate each
20 alternative at every step.

21 Do you agree with that?

22 A. You need to balance the thoroughness with the
23 capability of your tools -- if I got the first quote
24 right -- and that's what I did.

25 We have the tools that have the capability to do

1 plant-by-plant analyses. And it's important -- when you
2 can do that, you can see how different the answer gets.
3 It's very important to go forward and do that analysis.

4 So I agree with the point, and that's why I feel that
5 Dr. Deck did not go far enough.

6 Q. But you didn't look at, for example, the potential to
7 close a coal-fired unit and replace it with some other
8 type of capacity or replace it with purchased power, did
9 you?

10 A. That could be considered, but I did not.

11 Q. You didn't look at demand-side control programs, for
12 example, or sustainable energy like solar or wind as an
13 alternative to running old coal-fired units, correct?

14 A. I did not.

15 Q. And you're aware that the Clean Smokestacks Act in
16 North Carolina is a system cap on the Duke system and a
17 system cap on the Progress system? It doesn't proscribe
18 specific projects at specific plants, correct?

19 A. That's not actually my full understanding of it. It
20 is a cap.

21 Q. All right.

22 A. But it's my understanding that those planned FGDs,
23 that there was an agreement that the companies would be
24 able to recoup the cost if they worked according to that
25 plan for those FGDs and the SCRs.

1 Q. But it doesn't proscribe specific controls at
2 specific units; isn't that correct?

3 A. But they --

4 Q. That's my question.

5 A. I think it essentially does in terms of the financial
6 incentives for the companies.

7 Q. Let's talk about the value of a statistical...

8 (inaudible) --

9 (Interrupted by the court reporter.)

10 Q. You say in your report that Dr. Deck is correct that
11 the value he used is commonly used by EPA in its
12 Regulatory Impact Analysis.

13 A. Yes.

14 Q. And it was used by EPA in its Ozone Regulatory Impact
15 Assessment in 2008, correct?

16 A. I'm not sure it was in the ozone.

17 MR. GOODSTEIN: If I could approach, Your Honor?

18 THE COURT: Yes.

19 MR. GOODSTEIN: I have another exhibit to show.

20 Q. (By Mr. Goodstein) So you're aware of the Regulatory
21 Impact Analysis that was performed by EPA for the
22 2008 National Ambient Air Quality Standard for
23 (inaudible) ...

24 A. Yes, I'm aware of it. I haven't read the ozone one.
25 I'm more familiar with the PM2.5 one.

1 Q. Okay. So I'm showing you Plaintiff's Exhibit 549 for
2 identification, and I refer you to the excerpt attached
3 here. And it's 6-25 at the bottom of the page. It's the
4 third page of this excerpt.

5 And under Mortality Valuation: "The mean value of
6 avoiding one statistical death is estimated to be roughly
7 6.6 million in 1990 income levels, and 7.9 million in 2020
8 income levels."

9 You see that?

10 A. Yes.

11 Q. Is that essentially the value of statistical life
12 that Dr. Deck has used in his analysis in this case?

13 A. Yes.

14 Q. And I believe you've just said the PM actual in
15 2006 also used that same value; is that correct?

16 A. Yes.

17 Q. And the CAIR rule of 2005 also used that same value,
18 correct?

19 A. Correct.

20 Q. And that value is the mid point in the range. Isn't
21 that correct?

22 A. It's the mid point in that range.

23 Q. In fact, this Circular A-4 that we've been looking
24 at, Plaintiff's Exhibit 546, describes the range on page
25 30 in that excerpt as: "A substantial majority of the

1 resulting estimates of VSL vary from roughly 1 million to
2 10 million."

3 Is that correct?

4 A. You're talking about this --

5 Q. Page 30 in the excerpt of Circular A-4. And this is
6 at the top of the page.

7 "A substantial majority of the resulting estimates of
8 VSL vary from roughly 1 million to 10 million per
9 statistical life."

10 Is that correct?

11 A. It says that. And I point out that that's the range
12 for studies on wage compensation for occupational hazards.

13 Q. All right. And EPA uses a central value in that
14 range, correct?

15 A. They do.

16 Q. And you used a value at the lower end of that range.
17 Isn't that true?

18 A. I did that, yes.

19 Q. The value that you used --

20 A. Let me stop -- not at 1. I didn't go to the low end
21 of the 1 to 10.

22 Q. Right. You used 2.67 million, correct?

23 A. It wasn't quite that. I used 2 million in 1999
24 dollars. I think it was 2.4 million in 2006, but I'd have
25 to check my exact numbers.

1 Q. So you would agree that's the low end of the range?

2 A. No. The lower end of the range is below a million.

3 But this range is 1 million to 10 million.

4 But there are alternative ranges that could be worked
5 out than just this one, and 2 million is not the end of
6 the range; 2 million is a number in the range.

7 Q. All right. And you are familiar with the National
8 Research Council of National Academies and their report
9 regarding estimating mortality risk reduction and economic
10 benefits of controlling ozone air pollution.

11 A. What was the question?

12 Q. I'm asking you if you are familiar with the report
13 that was recently issued in April 2008 by the National
14 Research Council of the National Academies of Sciences.

15 A. Yes, I am.

16 Q. And you made a written and oral presentation to that
17 committee during that proceeding, didn't you?

18 A. I did. It was not about value of statistical life.
19 My presentation to that committee was not about the values
20 of statistical life. I made no comments to that committee
21 about the value of life at all.

22 Q. It didn't include your view of the value of
23 statistical life?

24 A. It did not. Dr. Deck stated that in his testimony
25 and it is false.

1 Q. All right. So that National Research Council -- and
2 I appreciate the correction.

3 I just want to find out if you agree with us that
4 that National Research Council that recently looked at
5 this issue determined that a change in the practice that
6 EPA has been using for many years was not indicated at
7 this time. Is that correct? With regard to the values of
8 statistical life?

9 A. They said that there is plenty of reason to believe
10 that these wage-based studies -- wage-risk based studies
11 are not getting at the type -- the value of the type of
12 risk that is in question in environmental -- in the air
13 quality rules, but that there is no empirical evidence at
14 this point that is strong enough to justify changing from
15 this basic practice that EPA has evolved to.

16 They did not say that they believe that 5.5 million
17 is the right number. They said that the -- this is the
18 interpretation. I would have to get the report and
19 read -- find the section to tell you why I have this
20 interpretation.

21 But they're basically saying there are alternative
22 ways, and the problem we have is that the science and the
23 evidence, the empirical evidence, just doesn't rise to a
24 level to justify a change in practice. They have good
25 reason to do that. They need to err on the side of

1 conservatism in this practice.

2 Q. And, in fact, that council, the National Research
3 Council, that looked at this issue and issued a report in
4 of April 2008 said that: "The empirical evidence of how
5 willingness to pay varies with population for risk
6 characteristics is not sufficiently consistent to support
7 a change in this practice that EPA has been using for many
8 years."

9 Is that correct?

10 A. That's what they said. And that, to me, says they're
11 looking for and expect to find alternative numbers, but
12 they haven't got it yet.

13 MR. GOODSTEIN: No further questions, Your
14 Honor.

15 MR. LANCASTER: Just have a few short questions.

16 I don't know if the answers will be short, but
17 I'll try to be quick.

18 THE COURT: All right. Go ahead.

19 **REDIRECT EXAMINATION**

20 BY MR. LANCASTER:

21 Q. Mr. Goodstein indicated to you that the literature
22 ranges with values from 1 to \$10 million for a value of
23 statistical life; is that correct?

24 A. Yes. For occupational risk hazards.

25 Q. And if you could explain briefly to the Court why you

1 chose the alternative value of statistical life value that
2 you chose in order to perform these sensitivity analyses
3 that you performed.

4 A. Yes. There is an alternative -- well, the value --
5 let me step back.

6 The occupational hazards are associated with studies
7 that look at individuals who are young and healthy and
8 working; they're workers. And they're looking at how much
9 additional wage they demand in order to accept the higher
10 risk associated with certain occupations. These are
11 generally accidental risks, for the most part, that are
12 being studied.

13 On average, and you can see this in the record, the
14 discussion, like, with the NRC committee and EPA's
15 advisory boards around this issue is that the average life
16 expectancy lost in those studies is 35 to 40 years, and
17 the average life expectancy that is generally believed to
18 be lost associated with these associations with PM2.5 is
19 maybe one to three years.

20 So the underlying idea, worry is that occupational
21 risk studies are valuing risks that involve a very
22 extensive loss of life in terms of each individual's
23 life-years lost and that risks that impose a far smaller
24 life years of loss, perhaps one year, two years, three
25 years, would have a lower value.

1 And the intuition behind that is clear. Nobel Prize
2 winners have written texts on cost-benefit analysis to
3 say, obviously, that would be true.

4 What EPA is struggling with is that, empirically,
5 there isn't a lot of alternative data to show what the
6 value is for the types of risks in question here. They're
7 a short period of life loss, usually at kind of the end of
8 the life span, which is why it's a short period that's
9 lost. These aren't accidental risks either. So they're a
10 very different type of risk. And the guidance all states
11 this and says you should be clarifying that this is a very
12 different type of risk than where the values have come
13 from.

14 I believe you can find that in Circular A-4. I know
15 you can find in EPA guidance. I know you can find it in
16 the advisory -- the advisories of the science -- the
17 Environmental Economics Advisory Committee to EPA. All
18 say you really need to bring this out and at least discuss
19 this.

20 In the past they've also said you should consider
21 alternative analyses. What has changed lately is this
22 unwillingness to advise EPA to be doing alternative
23 analyses in advance of having firm empirical evidence, but
24 it's because there is an absence of such firm empirical
25 evidence, not because the firm empirical evidence exists

1 and says these short life span reductions are worth
2 5.5 million as well.

3 Q. And Mr. Goodstein also showed you a chart, one of
4 your charts that you had prepared, based on the original
5 \$3 billion cost estimate that Dr. Staudt had put forward
6 early in this case but he subsequently revised.

7 Was there something about Dr. Deck's trial testimony
8 that caused you to use the chart you used rather than that
9 one?

10 A. Yes, sir. Dr. Deck's testimony, when he put that
11 exhibit up, basically said --

12 Q. Is that Plaintiff's Exhibit 390?

13 A. Yes, sir.

14 He basically said that he had replaced the original
15 estimate with the one in the middle when Dr. Staudt
16 offered a new estimate.

17 Something I didn't understand is apparently Dr.
18 Staudt offered two new cost estimates, and I don't know --
19 I don't know if we were looking at the second revision on
20 that middle column or the first revision. I couldn't
21 figure that out from what he said.

22 But he essentially said that's what he's relying on
23 now, that that's the new number, and it had a benefit --
24 the aggregate benefit-cost ratio was 1.05, not 1.3. So
25 then on that same -- here we go. Here is the exhibit. So

1 you can see on this --

2 Q. It's now on the monitor, the exhibit you're referring
3 to? Go ahead.

4 A. Yes. Thank you.

5 So what I was speaking to here, if you'll look at --
6 the three columns are Dr. Deck's three different
7 estimates, and the 1.3 in the first column for
8 benefit-cost ratio for North Carolina alone that you see
9 there, that was where -- what was in his original report
10 based on the data on costs in Dr. Staudt's original
11 report, which my table that was put up in my
12 cross-examination was started from.

13 But Dr. Deck, in his testimony, said he's using this
14 supplemental report from Dr. Staudt now. So I don't know.
15 And I don't recall why he said he is still putting the 1.3
16 up. But he was saying his final number, if you will, is
17 the one that's using Dr. Staudt's current cost estimates,
18 and that's, as I understood it, to be the middle column
19 where the ratio you see is 1.05.

20 He then has this third column. And it was unclear to
21 me from his testimony whether he was giving it 50/50
22 credence or not, but he talked about it in the same
23 breath, where he's using Mr. Scott and Nash's estimate,
24 which is the one that I was using on the Table F-2.

25 As you can see, the ratio of 1.05 falls down to .94.

1 But the one I worked off of was comparable to this .94.

2 It wasn't comparable to the 1.5 -- 1.05 exactly.

3 But what you see here is if the difference of opinion
4 about costs alone, the cost of the control measures alone,
5 is in the range between the second column and the third
6 column -- and from Dr. Deck's testimony, that's what I
7 picked up as the current discussion around costs -- you've
8 got a 50/50 chance that even the whole package of control
9 measures doesn't pass the cost-benefit test. 50/50
10 because 1.05 is just a little bit below 1, and .94 --
11 sorry -- is a little bit above 1, and .94 is just a little
12 bit below 1. The value of statistical life, to switch
13 that 1.05 down to below 1 only needs to change down to
14 something like 4.2 million, I think.

15 So it's extremely sensitive at this point. And
16 that's why I was saying you've got -- when you've got that
17 much of a knife-edge kind of, maybe it will give you some
18 benefits, maybe it won't; you really need to disaggregate
19 and say, what's behind that number.

20 That's why I started from Table F-2 and said let's
21 look at the cost-benefit ratios -- I only had a table that
22 was comparable to the third column, but it's not that far
23 different, as you can see, from what I would have gotten
24 if I had done the middle column with the 1.05.

25 And when we work into that, we see, well, it's close

1 to losing money, or it does lose money if you're working
2 with the third column because the ratio is below 1 there.

3 But there are a couple projects within that that are
4 good. And the reason it's losing money is because the
5 vast majority of -- well, the majority of the projects on
6 the list of 15 are bad investments.

7 **Q.** Does Dr. Deck's .94 in the middle of the final column
8 using TVA's cost estimate indicate that even under his
9 aggregated approach the proposed projects don't pass the
10 cost-benefit test?

11 **A.** That's correct, yes.

12 **Q.** And in terms of disaggregating, Mr. Goodstein showed
13 you excerpts of Circular A-4 from the Office of Management
14 and Budget.

15 Are there other portions of that document that he did
16 not include that address the question of whether the
17 cost-benefit analysis should be aggregated?

18 **A.** I don't know if they're included or not, but there is
19 a portion of this document that says that you should look
20 at the proscribed -- I think -- I don't have -- the quote
21 is in my document.

22 **Q.** I believe it's quoted on page 11 of your first
23 report.

24 **A.** Thank you.

25 Yes. Page 11. And it's the quote there. And that

1 comes from Circular A-4, page 16 -- which is not what I
2 was handed.

3 And the quote says: "You should carefully consider
4 all appropriate alternatives, and where there is a
5 continuum of alternatives for standard, such as the level
6 of stringency, you generally should analyze at least three
7 options."

8 And by that, they mean three levels: The one you
9 proposed, one more stringent, one less stringent, for
10 instance.

11 "Whenever you report the benefits and costs of
12 alternative options, you should present both total and the
13 incremental benefits and costs, and you should present
14 incremental benefits and costs as differences from the
15 corresponding estimates associated with the next less
16 stringent alternative."

17 The application, practical application, here to my
18 Table F-2 -- see, .94 here or 1.05, either one, is just
19 saying here is the prescribed alternative, and it's not
20 saying what if we did a little less, what if we did a
21 little more around that prescribed alternative.

22 So it's violating this statement here that came from
23 Circular A-4 as well.

24 And in my Table F-2, where we look at several
25 different levels, in fact, 15 different levels,

1 potentially, of control, not just three, and you can see
2 from that that there are some -- there's some amount of
3 control that would be, with these -- all the other
4 assumptions held constant, would produce positive net
5 benefits and would give you a better overall benefit-cost
6 ratio and higher net benefits. In fact, it would give you
7 positive net benefits. And the set of all 15 is clearly
8 inferior, but you can't see that without doing the
9 alternative levels of control in your analysis.

10 Q. And is Dr. Deck's aggregated approach contrary to the
11 guidance in Circular A-4?

12 A. It is contrary to this guidance, and in other ways
13 too, that I mentioned.

14 **MR. LANCASTER:** No further questions, Your
15 Honor.

16 **MS. GOODSTEIN:** Your Honor, we would just offer
17 Plaintiff's Exhibit 546, which is the OMB Circular
18 excerpts, and Plaintiff's Exhibit 549, which is the Ozone
19 Regulatory Impact Assessment excerpt.

20 We have no further questions.

21 **THE COURT:** All right. 546 and 549?

22 **MR. GOODSTEIN:** 546 and 549, Your Honor.

23 **THE COURT:** Let those be admitted.

24 **(Plaintiff's Exhibits 546 and 549 received.)**

25 **THE COURT:** All right. Thank you, Doctor. That

1 will complete your testimony and you are excused.

2 **THE WITNESS:** Thank you.

3 **THE COURT:** All right. Take a 15-minute recess.

4 **(Recess.)**

5 **THE COURT:** Mr. Lancaster?

6 **MR. LANCASTER:** At this time, Your Honor, may we
7 move into evidence some discovery designations?

8 **THE COURT:** Yes.

9 **MR. LANCASTER:** Defendant moves into evidence
10 Defendant's Exhibit 462, which are Plaintiff's Answers to
11 Interrogatories; 463, which are Plaintiff's Response to
12 Defendant's Request for Documents; 464, which is a letter
13 specifically identifying certain documents as responsive
14 to certain requests; 465, which are copies of the
15 documents so identified in the letter; and 530 through
16 537, which are deposition designations already on file
17 with the court filed back in May and are the counterpart
18 to the counter-designations that plaintiffs have already
19 introduced into evidence.

20 **MR. GULICK:** Your Honor?

21 **THE COURT:** Wait just a minute.

22 All right. Mr. Gulick.

23 **MR. GULICK:** Your Honor, I'm not clear as to
24 whether or not Defendant TVA is seeking to introduce the
25 discovery designations for Wyat Appel, George Bridgers, or

1 Sheila Holman, but their designation indicated that they
2 would seek to introduce those, provided that they were
3 unable to present live testimony in court.

4 As we know, today they have presented the live
5 testimony of Wyat Appel and George Bridgers, who have
6 testified from the stand. And in addition, they
7 subpoenaed also Sheila Holman. Sheila Holman is here in
8 the courtroom today and is available to testify if TVA
9 chooses to call her, and we believe that the
10 appropriate -- if they want her testimony, they should put
11 her on the stand.

12 Otherwise, we would request that all of those
13 discovery designations with respect to those three
14 individuals be excluded. None of them is a manager, and,
15 indeed, their supervisor, Brock Nicholson, was the first
16 witness in this case.

17 **MR. LANCASTER:** And, Your Honor, among the
18 deposition designations, three of them are actually
19 30(b)(6) depositions which are admissible under
20 Rule 32(a)(3). The remainder are not 30(b)(6)
21 depositions, but, in fact, the plaintiff has already moved
22 into evidence its counter-designation portions of those
23 depositions already, and we believe that for completeness
24 of the record, Defendant's 530 through 534 should come in
25 as well to complete the deposition record and to provide

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1 the other side of the portions that plaintiff has already
2 introduced.

3 **MR. GULICK:** Well, Your Honor, we, of course,
4 introduced our counter-designations because of their
5 designations, so I have no problem withdrawing the
6 counter-designations of those three individuals in light
7 of these circumstances, Mr. Appel and Mr. Bridgers
8 appeared and testified, and since Sheila Holman is here
9 and available to testify.

10 With respect -- I'm not making this request with
11 respect to any of their 30(b)(6) designations. None of
12 these was a 30(b)(6) designee.

13 **THE COURT:** I'm not sure where we are.

14 **MR. LANCASTER:** I think I can summarize. 462
15 through 465, which were discovery responses, there was no
16 objection.

17 **MR. GULICK:** That's correct.

18 **MR. LANCASTER:** 535 through 537 --

19 **THE COURT:** All right. Let's see. 462, 463,
20 464 and 465.

21 **MS. COOPER:** Yes.

22 **THE COURT:** There are no objections to those?

23 **MR. LANCASTER:** Is that correct, Mr. Gulick?

24 **MR. GULICK:** Well, Your Honor, we had already --
25 actually, we had made objections which we had already

1 filed with the court, but I have no further objections
2 than those.

3 **THE COURT:** I don't see how I can rule on these
4 without going through and reading all of these objections.
5 Have you got any suggestions?

6 All right. That's 463, 464 -- 462, 3, 4 and 5.
7 And you filed objections to all of them?

8 **MR. GULICK:** I believe we did, actually, Your
9 Honor. I may have misspoken here.

10 **MR. LANCASTER:** Your Honor, it simply states
11 that objections contained therein are preserved, as I'm
12 looking at the objections filed by the plaintiff.

13 **MR. GULICK:** Yes.

14 **THE COURT:** They are? I didn't hear the last
15 part of that.

16 **MR. LANCASTER:** As I understand the objection
17 that was filed by the plaintiff -- these are discovery
18 responses. These are admissions of a party opponent
19 interrogatory responses and document requests responses.
20 And I understand the objection is that certain objections
21 were asserted during the course of the documents and
22 plaintiff wished to preserve those. I don't recall how
23 many of those were objected to. But the plaintiffs, in
24 fact, answered a number of the interrogatories and
25 answered a number of the document requests. Those are the

1 ones we are seeking to introduce into evidence, similar to
2 the way the plaintiff moved into evidence defendant's
3 interrogatory responses.

4 **THE COURT:** All right. I'll just read them and
5 rule on them after having done so.

6 Now, 530 to 537, what's that?

7 **MR. LANCASTER:** Okay. As I understand that, the
8 latter three of those, 535, is Secretary Ross's 30(b)(6)
9 deposition; 536 is Mr. Chinkin's 30(b)(6) deposition; 537
10 is Mr. Buckheit's 30(b)(6) deposition. And I understood
11 Mr. Gulick to say there was no objection to the admission
12 of the 30(b)(6) depositions.

13 **MR. GULICK:** That's correct.

14 There were, of course, objections made during
15 the course of those depositions which we would reserve.

16 **THE COURT:** I'm going to do the same on this
17 other. If you're going to -- I can't rule on objections
18 until I read them in the context in which they are made.

19 **MR. LANCASTER:** I apologize, Your Honor. This
20 was meant to be a rather quick process. We were simply
21 attempting to move in these discovery responses in the
22 same way that the plaintiff had done.

23 Perhaps they could be admitted subject to those
24 objections, and if any portion is cited by TVA that is
25 subject to an objection, the defendant can point that out,

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1 for instance, in post trial filings. I'm sorry -- excuse
2 me -- the plaintiff can point that out.

3 **THE COURT:** They are all listed here. I will
4 admit the ones to which there are no objections.

5 Now, give me those numbers.

6 **MR. GULICK:** Well, Your Honor, we had objections
7 that were contained within the depositions themselves.

8 **THE COURT:** I understand that, but I thought
9 there were some to which you had not lodged objections,
10 530, 531, 532. If there are objections to all of them --

11 **MR. GULICK:** Well, the ones that we would not
12 object to, unless they were part of objections that were
13 made during the course of the depositions, were Ross
14 30(b)(6), which was 535; Chinkin 30(b)(6), which is 536;
15 and Buckheit, 30(b)(6), which is 537, except to the extent
16 the objections were made during the deposition.

17 **THE COURT:** All right.

18 **MR. GULICK:** Which mostly go to scope, but they
19 may have gone to some other issues as well.

20 **THE COURT:** I will reserve admission of all of
21 them until I read what's involved. That's the only way I
22 can make a rational ruling on it.

23 **MR. LANCASTER:** Thank you, Your Honor.

24 **THE COURT:** What's the next -- do we have any
25 more?

KAREN H. MILLER, RMR-CRR (828) 771-7217

1 since March of '05.

2 As such, I have responsibility for the day-to-day
3 management of TVA. I report to a board of directors that
4 is appointed by the President, nine members, seven of
5 which have to live in the valley and two of which may live
6 elsewhere, and they're appointed for five-year terms each.

7 And as I said I manage the day-to-day operation.

8 Q. How long have you been with TVA?

9 A. A little over three years.

10 Q. Before you came to TVA, where were you employed?

11 A. At Progress Energy in Raleigh, North Carolina.

12 Q. Would you describe for the Court your employment with
13 Progress?

14 A. Would you repeat?

15 Q. Would you describe for the Court your employment with
16 Progress?

17 A. Yes. I came to Progress Energy in 1998 as senior
18 vice president of the fossil operations. I had
19 responsibility for many of the plants that have been
20 mentioned here this morning and this afternoon.

21 In about two years, Progress Energy, then Carolina
22 Power & Light, bought Florida Power Corp., and it became
23 Progress Energy, and at that time I was assigned to run
24 one of their three subsidiaries.

25 The three subsidiaries are Progress -- well, Progress

1 Carolina now, Progress Florida -- and my responsibility
2 was Progress Energy Ventures, which had other things, like
3 independent power plants in Georgia; we had gas wells in
4 Texas; and we had some coal mines in Kentucky.

5 Q. Do you have family in North Carolina, Mr. Kilgore?

6 A. I have a son and his wife and two grandchildren in
7 Jefferson.

8 Q. Would you describe for the Court briefly your
9 experience in the electric power industry before you were
10 at Progress?

11 A. I was -- it began in 1968, working for TVA. I was a
12 college student, and the year I got married I worked for
13 TVA, testing the precipitators at Bull Run and Widows
14 Creek, which were being tested for warranty. That was one
15 of the first pollution control devices to be put on in
16 1968. And so I spent the summer shuttling between Bull
17 Run, Widows Creek, and one or two trips to the Allen plant
18 out in Memphis.

19 After that, I finished my college education, and
20 after a brief stint in the army I went to work for the
21 Army as a civilian -- I'm going to get to the utility part
22 real quick -- and worked for them, including a short stint
23 at Pine Brook Arsenal, doing pollution control and
24 construction there.

25 And then I wound up working at Arkansas Power & Light

1 in Little Rock, and helped start up a nuclear plant and
2 ran their fossil operations.

3 Then after about seven years there, I went to
4 Atlanta, Georgia, and worked for Oglethorpe Power
5 Corporation, which is a generation and transmission
6 cooperative that is composed of 39 membership cooperatives
7 in Georgia. And I worked there for 14 years, the last
8 seven as their president and CEO.

9 And then in 1998, as I said, I went to work for
10 Carolina Power & Light, subsequently Progress Energy.

11 And then in '05, I got a call from a headhunter, and
12 they asked me would I be interested in coming back to TVA.
13 So I started that process. And I tell folks it took me 40
14 years to get 40 miles, because I grew up south of
15 Chattanooga, about 40 miles from Chattanooga.

16 **Q.** All right, sir.

17 Now, Arkansas Power & Light and Progress are
18 investor-owned utilities; is that right?

19 **A.** That's correct.

20 **Q.** And Oglethorpe is a public power company?

21 **A.** That's correct.

22 **Q.** Now, would you describe for the Court the scope of
23 TVA's duties and responsibilities under the Federal TVA
24 Act.

25 **A.** Our mission has not changed in 75 years, really.

1 It's about energy, the environment, and economic
2 development.

3 Under the environment, we have navigation and flood
4 control. In the beginning in 1933, it was about more
5 taming the river, recovering the resources, and things
6 like that. And as we grew and put dams on the river and
7 grew our system, then we added capacity to support the war
8 effort and began to build coal plants. And then in the
9 early '70s we built nuclear plants. And so we now have a
10 full portfolio.

11 And our mission has not changed. It's to produce
12 energy for parts of seven states, about 8 million
13 residents, and take care of the environment, air and water
14 and solid waste, and then, also, participate with the
15 states in economic development.

16 Q. How many employees does TVA have?

17 A. We have roughly 12,000 at any given time. Given
18 retirements and things like that, there may be a few less
19 or a few more.

20 We're organized into several divisions. I'll kind of
21 tick those off and make sure I try to cover all of them.

22 First of all, our operating group that has the
23 production and the transmission of electricity; that is,
24 the nuclear operations, the fossil operations, both coal
25 and gas, and the hydro operations. And then we have

1 transmission associated with that. So that's the people
2 that make the power and get it distributed, including
3 running the second-by-second control center. Electricity
4 travels at the speed of light, so when it's not there, it
5 doesn't travel at the speed of light, so we have to be on
6 our toes all the time.

7 In addition to the operating group, we obviously have
8 a financial group; we have a customer group; we have an
9 office of environment, and research and development.
10 That's where most of our "ologists" reside. They do the
11 research. They also look at environmental policy and
12 provide the single point of contact to our regulators.

13 And we obviously have a general counsel, which you
14 folks are part of.

15 Let's see if I've forgotten anybody. Probably have.

16 Administration. We have a support group that takes
17 care of the buildings and all those kind of things,
18 procurement and those kind of things.

19 I think that covers most of them.

20 Q. Thank you.

21 Now, you've mentioned the TVA board of directors. As
22 TVA's CEO, do you report to them?

23 A. I do.

24 Q. And what are their responsibilities?

25 A. Their responsibilities are to oversee what we do, set

1 policy that we can then operate within from day-to-day.
2 They normally meet about six times a year.

3 As I said, they're appointed by the president. The
4 Senate has to confirm them. Right now, we have two
5 vacancies that are getting considered.

6 Seven of those folks have to live inside the
7 Tennessee Valley area and two may live outside our service
8 territory. We have a pretty good balance right now. We
9 have one from Knoxville, one from Nashville, one from
10 Memphis, one from Mississippi, one from Alabama and one
11 from Georgia, and our out-of-state -- or out-of-territory
12 director lives in Kentucky, but not in the TVA service
13 area.

14 Q. Now, Mr. Kilgore, you have been involved in running
15 both investor-owned utilities such as Progress, and TVA, a
16 public power system.

17 How is TVA different from investor-owned utilities
18 such as Progress?

19 A. Well, the two investor-owned utilities I worked for
20 and all investor-owned utilities have shareholders, and
21 they, of course, get equity from those shareholders, and
22 they use that equity plus debt to build their plants, and
23 they want a return on that equity to pay back to those
24 shareholders.

25 TVA and Oglethorpe, which I also worked for, public

1 power, do not have shareholders. TVA's case, we're a
2 wholly-owned corporation of the government, and so, as we
3 have earnings, so to speak, the investor-owned would use
4 those earnings to have some retained earnings and some to
5 pay dividends back to their shareholders.

6 In TVA's case, what we have in terms of earnings are
7 always used to pay down debt or to reinvest in the system.
8 If we had large earnings, we could, of course, consider
9 reducing rates, but that hasn't been a problem lately,
10 with everything -- all the costs that have been running
11 up.

12 Q. What is your basic philosophy of running TVA?

13 A. Well, I like to have something that everybody can
14 remember. I don't like for them to have to go read
15 anything. So for my leadership, my officer group, I had
16 our shop make a little TVA brass emblem, and it has one
17 word on it, and that word is "better." And that's what we
18 try to do. I challenge all my leadership team: Your job
19 is to make TVA better tomorrow than it was today, better
20 next week than it was this week, and better next year than
21 it is this year.

22 So, really, it's about a step-by-step improvement in
23 what we do and continue to prosecute that. I often use
24 the example with my leadership team that the difference
25 between a run-of-the-mill baseball player that hits .250

1 and a potential Hall of Famer that hits .333 is about one
2 hit per week. And so that's my challenge to them, let's
3 have one good idea, one good thing a week that we can do
4 better as we go.

5 Q. Mr. Kilgore, you testified there are essentially
6 three parts to TVA's mission, one of them an environmental
7 part.

8 Has the TVA board of directors adopted an
9 environmental policy?

10 A. They have.

11 Q. And for the record, that policy has been admitted as
12 TVA Defendant's Exhibit 182.

13 What is the purpose of the policy?

14 A. Well, we adopted a strategic plan. When the board
15 first came, they wanted an overarching strategic plan that
16 they could use as a framework. And as we got into that
17 strategic plan, with all the challenges of the
18 environment, everything from air, the current concern
19 about climate change, and the water, which is really a hot
20 topic also, we decided that we needed to have a more
21 specific environmental policy that the board adopted that
22 management could then manage to.

23 So we went through a process of drafting such a plan,
24 sending it out for comments. We had a very thorough
25 public vetting of that. We had comments. We had about

1 seven or so public meetings inside our territory and we
2 entertained all kinds of commentary. Then the board
3 considered those comments and finalized that policy and
4 approved it.

5 Q. Would you describe to the Court the many points of
6 TVA's environmental policy as it involves air quality.

7 A. Well, very simply, I would say it is to get better.
8 It is -- if you'll notice the words. And I don't have
9 them memorized. But the words basically say that we're
10 going to continue to progress toward cleaner air, and we
11 want cleaner water. And we also deal with solid waste.

12 Q. How is the policy of getting better -- which I assume
13 includes reducing emissions. Is that right?

14 A. Yes.

15 Q. How is that policy being implemented?

16 A. Well, many of the things we've talked about today.
17 We are putting on scrubbers on the plants that have been
18 mentioned: Bull Run, Kingston, John Sevier.

19 Today, one of the board committees is being briefed
20 by my staff on the next possible project, and we're
21 discussing what the next project should be.

22 Q. How does TVA decide where and when to install
23 pollution control equipment?

24 A. Well, we basically look where we can get the most
25 reduction for our dollar. We look at what we have and we

1 say where can we spend the next dollar and get the biggest
2 amount of reduction.

3 Q. Is TVA going to operate the scrubber that is nearly
4 completed at Bull Run?

5 A. Yes, we are.

6 Q. Is TVA committed to finishing construction of the
7 scrubbers at Kingston and then operating them?

8 A. We are.

9 Q. Is TVA committed to building and operating a scrubber
10 and SCRs at John Sevier?

11 A. We are. The board has approved those, and we're in
12 the middle of construction. I would just say --

13 Q. At John Sevier?

14 A. At John Sevier. Well, all of those. The board has
15 approved all of them, and we're under construction, almost
16 finished at Bull Run; Kingston a little bit less far
17 along; and John Sevier, we're doing the engineering and
18 going out for procurement.

19 Q. Is TVA committed to finishing the switch to lower
20 sulfur coal at Johnsonville?

21 A. Yes, we are.

22 Q. Is TVA committed to operating the SCRs at its
23 coal-fired plants year round starting in January, 2009?

24 A. We are.

25 Q. Why is TVA doing that?

1 A. Well, I think there's three reasons. One, kind of
2 the future sense that, you know, despite the fact that
3 we've had some upset in CAIR and things like that, we
4 don't expect the future regulations to get less, and so
5 it's time for us to get on with operating this.

6 We've invested a lot of money. So we'll operate
7 these. We'll learn how to operate them better. We'll
8 probably have some early issues with the equipment, so
9 we'll operate those and learn how to operate them real
10 well. So it makes sense in a future sense.

11 It also makes sense from a regulatory sense because
12 the regulators in our state are not going to -- there's a
13 lot of other regulations out there besides the Clean Air
14 Interstate Rule, and they're not going to just sit idly by
15 and let us not finish what we've committed to and what
16 we've started.

17 And then, finally, it just makes common sense because
18 we've invested almost a billion dollars out of about a
19 billion-three in east Tennessee, and it would be foolhardy
20 not to complete that and operate those. And it's just the
21 right thing to do.

22 MS. COOPER: No further questions, Your Honor.

23 THE COURT: Mr. Bernstein?

24 | >>>

CROSS EXAMINATION

1 BY MR. BERNSTEIN:

2 Q. Mr. Kilgore, I just heard in your testimony that you
3 were committed to building a scrubber at John Sevier.

4 A. That's correct.

5 Q. And the current status of that scrubber is there's
6 just an empty field there; is that correct?

7 A. I'm sorry. Repeat that?

8 Q. The current status of that scrubber is there is just
9 an empty field at John Sevier currently; is that correct?

10 A. I'm sorry. My hearing, with all the miles of plant
11 tour behind me -- let me state what I think I heard you
12 ask and see if that satisfies you.

13 We're designing and procuring the equipment to go in
14 at John Sevier.

15 Q. And TVA -- was TVA somewhat less committed to
16 building a scrubber at Colbert 5?

17 A. Less committed?

18 Q. Is it correct that TVA announced a scrubber at
19 Colbert 5 some six years ago and that once a New Source
20 Review lawsuit was dismissed with regard to Colbert 5, the
21 schedule for that scrubber was pushed back. Was that not
22 correct?

23 A. The Colbert scrubber was pushed back and the John
24 Sevier scrubber was moved up.

25 Q. So TVA was a little less committed to the scrubber of

1 Colbert 5. It's not currently on the schedule that was
2 originally announced. Is that correct?

3 A. As I said, we moved John Sevier up. And there is
4 only so much we can do at one time. And we substituted a
5 plant that we thought had better impact, John Sevier, for
6 one that had lesser impact at Colbert.

7 Q. So why was Colbert selected originally to have a
8 scrubber if it has less of an impact than John Sevier?

9 A. I don't know that answer.

10 Q. I heard you discuss CAIR, the Clean Air Interstate
11 Rule, in your testimony, and we've heard a bit about that
12 over the last few days.

13 My impression is that your employees testified that
14 CAIR was somewhat of a packaging of other control programs
15 and that the fact that it was vacated was not terribly
16 significant for your plants. Is that your view?

17 A. It does not change what we're going to do to clean up
18 the air.

19 Q. Is that your view of the Clean Air Interstate Rule,
20 that it was simply sort of a packaging of other control
21 requirements?

22 A. My view of CAIR is that it provided a mechanism to
23 have the interstate boundary issues taken care of, as well
24 as a couple of other appeal processes, and it doesn't
25 relieve us from underlying regulations or our commitment

1 to clean up the air.

2 Q. Well, you would agree, wouldn't you, that CAIR
3 required significant additional reductions in utility
4 emissions of sulfur dioxide and nitrogen oxides in the
5 eastern half of the United States, which includes all of
6 TVA's operating area?

7 A. I would agree that it was an overarching thing that
8 had rules in it that caused that, yes.

9 Q. Did it require significant and additional reductions
10 compared to the other rules that are in place?

11 A. I'm not enough of an expert on the other rules in
12 place to attest to that.

13 **MR. BERNSTEIN:** Request to approach the witness?

14 **THE COURT:** Yes.

15 Q. (By Mr. Bernstein) Mr. Kilgore, does this appear to
16 be Tennessee Valley Authority's form 10-K submitted to the
17 Securities and Exchange Commission for the period ending
18 September 30th, 2007?

19 A. Yes.

20 Q. And if you would turn to page 79 in that document,
21 does it not state on the top of that page that: "CAIR
22 requires significant additional utility reductions of
23 emissions of sulfur dioxide and nitrogen oxide in the
24 eastern half of the United States, including all of TVA's
25 operating areas"?

1 Second sentence on the top, sir.

2 **A.** I see that.

3 **Q.** Is that a correct statement?

4 **A.** Yes.

5 **Q.** So CAIR did require significant and additional
6 utility emissions reductions of NOx and SO2; isn't that
7 correct?

8 **A.** I agree with the statement as written.

9 **Q.** Okay. Now, Mr. Kilgore, you have a significant
10 history in the utility industry. You were probably aware
11 that acid rain was a major problem coming on the scene in
12 the late '70s and early '80s; is that correct?

13 **A.** Generally familiar with that, yes.

14 **Q.** And the acid rain program under Title IV of the Clean
15 Air Act, that was a significant program, was it not?

16 **A.** Yes.

17 **Q.** But despite the fact that TVA knew about acid rain
18 and its effects in the late '70s and early '80s, TVA spent
19 virtually nothing combating acid rain until the Title IV
20 program kicked in and required TVA to install control
21 technologies.

22 **A.** I can't speak to that history.

23 **Q.** Give me just a minute, Mr. Kilgore.

24 **A.** Sure thing.

25 **Q.** Mr. Kilgore, what is shown on the screen here before

1 you is TVA's trial exhibit marked for identification as
2 168, which is the expert report of Mr. Gordon Park. And
3 would you agree with me that what this exhibit appears to
4 show is that TVA spent virtually no money between 1983 and
5 1993 on emission control technologies?

6 **A.** Give me just a minute now, since you took a minute.

7 Your question is now from 19 --

8 **Q.** 1983 to 1993.

9 **A.** In 1983 -- I would just say it appears your
10 conclusion is correct.

11 I would also note that before that there were
12 substantial results from 1974 to 1983.

13 **Q.** And that was due to the fact that TVA had conceded
14 violations of law with regard to several facilities and
15 had to be subject to consent decrees in Alabama, Kentucky,
16 and Tennessee in order to force TVA to make those
17 reductions; is that not correct?

18 **A.** That is my understanding.

19 We put scrubbers in. So we had scrubbers in. In
20 1977, I think, was the first one, and as I left Progress
21 Energy, we didn't have a single one in at Progress yet.

22 **Q.** And so during the time when TVA knew that acid rain
23 was a problem in the '80s, it did not install control
24 technologies between '83 and '93, until the Clean Air Act
25 required those technologies under Title IV; isn't that

1 correct?

2 **A.** For the period you're sorting out there, the one flat
3 period in the chart. You'll notice the ones before and
4 after that show a decline.

5 **Q.** Now, I did hear you testify that you're in the middle
6 of building a scrubber at Bull Run and Kingston, and you
7 have other announced scrubbers and NOx controls in your
8 plan, and your employees and you have all discussed how
9 you're going to complete these projects.

10 But what I have to ask you is, hasn't TVA halted
11 major capital projects after submitting impact on
12 investment previously?

13 **A.** Yes.

14 **Q.** And those projects would be, for example, Hartsville
15 A, Hartsville B, Phipps Bend, Yellow Creek, Watts Bar 2,
16 Bellefonte 1 and Bellefonte 2?

17 **A.** That's correct. All canceled nuclear units.

18 **Q.** And those projects were put on ice after as much as
19 eight years of construction had gone by. Isn't that
20 right?

21 **A.** That's probably true.

22 **Q.** And TVA, as we learned before, has also put scrubbers
23 on hold, for example, at Colbert 5.

24 **A.** That's true. But we substituted something that we
25 thought was better value.

1 Q. Mr. Kilgore, in the Clean Air Interstate Rule, EPA
2 determined that the implementation of highly
3 cost-effective SO₂ and NO_x controls on power plants in the
4 eastern U.S. would result in 17,000 fewer premature deaths
5 annually.

6 TVA's expert, Suresh Moolgavkar, has come into this
7 court and he has disagreed with those numbers and, in
8 fact, has declared, quote: "These numbers cannot be taken
9 seriously."

10 Is that your position, sir?

11 A. I can't testify to an epidemiologist's report.

12 Q. So is it your testimony that the EPA is the expert
13 federal agency charged with implementation of the Clean
14 Air Act?

15 A. Yes.

16 Q. And that TVA is not charged with implementation of
17 the Clean Air Act and Congress has not delegated
18 implementation --

19 (Interrupted by the court reporter.)

20 Q. Isn't it a fact that Congress has delegated
21 implementation to the Environmental Protection Agency as
22 the expert agency to implement the Clean Air Act?

23 A. That is my understanding.

24 Q. And it has not done so with regard to TVA?

25 A. True.

1 Q. So TVA would not dispute the EPA's finding that
2 implementation of NOx controls on power plants would
3 result in 17,000 fewer deaths annually?

4 A. Well, I'd have to see the context of all that to see
5 whether that's an EPA study or EPA mandate. They put out
6 a lot of technical papers that have a lot of things going
7 on, and I can't tell from what you're telling me whether
8 that's a rule-based item or just a study conclusion.

9 Q. It was in the Regulatory Impact Assessment for the
10 Clean Air Interstate Rule.

11 So would TVA agree with that assessment or does TVA
12 dispute that?

13 A. Again, I can't testify to that just based on what
14 little you're giving me.

15 Q. So you can't tell me whether the -- whether you agree
16 with the testimony of Suresh Moolgavkar that these numbers
17 cannot be taken seriously?

18 **MS. COOPER:** Your Honor, I'm going to object to
19 this line of questioning. Mr. Kilgore has said he's not
20 an epidemiologist and he doesn't have expertise in this
21 area.

22 **THE COURT:** I'll sustain that.

23 **BY MR. BERNSTEIN:**

24 Q. Mr. Kilgore, is it correct that TVA is has a triple-A
25 credit rating?

1 A. That is correct.

2 Q. And a triple-A credit rating is the highest rating a
3 company can have?

4 A. That is correct.

5 Q. And TVA is the only utility that has a triple-A
6 credit rating?

7 A. I don't know that. But we're one of few, if we're
8 not the only one.

9 Q. And TVA's rates are some of the lowest in the
10 country.

11 A. I think so.

12 Q. And these facts are a good indicator of TVA's
13 financial health, are they not?

14 A. Well, we have a lot of debt that we had from those
15 canceled nuclear plants that you mentioned back there, so
16 our financial health is -- in terms of the rates, we're
17 doing well on rates; we're doing well in paying down our
18 debt. But we have a substantial amount of debt that
19 probably is larger than most of those other folks, too.

20 Q. But TVA's bonds are listed as triple-A and
21 investment-free.

22 A. That is true.

23 Q. Mr. Kilgore, did you receive a significant raise
24 recently?

25 A. I did. It's all in potential pay; it's not in real

1 pay, if you want to see my W-2s.

2 Q. We're not asking to see your W-2s.

3 In fact, did TVA pay a consultant to determine how
4 much more money you should make?

5 A. Yes.

6 Q. And isn't your pay tied to TVA's performance?

7 A. Yes. Part of it.

8 Q. So you have a base salary and you have incentives?

9 A. I do.

10 Q. And in fact, the annual incentive plan is designed to
11 encourage and award executives for their contributions to
12 successfully achieving short-term financial and
13 operational goals of TVA in its applicable business units?

14 A. No, I would disagree with that.

15 The strategic plan lays out long-term goals and other
16 goals other than just short-term operational goals.

17 They're published pretty well on our web site.

18 Q. But at least a part of the aspect of your annual
19 incentive plan is designed to encourage and award
20 executives for their contributions to successfully
21 achieving short-term financial goals. Isn't that correct?

22 A. Part of my job is to make sure I balance the
23 short-term and the long-term and get good results all the
24 way around and don't have that just happen one year but
25 have that happen on a sustainable basis.

1 Q. And overall, Mr. Kilgore, isn't it true that
2 approximately 40 to 50 percent of overall compensation for
3 the high-ranking executive officers at TVA is
4 performance-based compensation?

5 A. Yes.

6 Q. Now, is that performance-based compensation based in
7 part on your Winning Performance Scorecard?

8 A. Yes, it is.

9 Q. And is this the same Winning Performance Scorecard
10 that the TVA Inspector General determined only a few
11 months ago provided a financial incentive to keep a plant
12 operating, even though the plant was experiencing extreme
13 problems and was subject to major -- and the repair
14 process would be a major operation?

15 A. I assume you're quoting. It sounds generally
16 correct.

17 Q. And could you tell me what the total combined
18 compensation is for you and your officers, Mr. William
19 McCollum and Karl Singer?

20 A. Could I tell what?

21 Q. The total compensation combined for you, William
22 McCollum, and Karl Singer.

23 A. Karl Singer is no longer with the company, and so he
24 hasn't been there for some time.

25 Mr. McCollum and I have the potential of about 4 to

1 4-and-a-half million dollars. I will tell you, my W-2
2 last year was \$770,000. I don't mind saying that.

3 Q. And if you add in Karl Singer and his compensation
4 from, I believe it was last year, that figure would rise
5 to about a total of \$7 million, would it not?

6 A. I'll take your study to be correct.

7 Q. And, Mr. Kilgore, could you tell me how much money
8 TVA spent constructing SCRs and SNCRs at its plants last
9 year?

10 A. I don't have that number in my head. I'm sure it's
11 been entered into the record. If it hasn't, we could get
12 it for you.

13 Q. Well, I have it right here. Would you agree or not
14 that it is, in fact, only \$7 million?

15 A. It's how much?

16 Q. \$7 million.

17 A. 7 million?

18 Q. 7 million.

19 A. On how much?

20 Q. \$7 million on --

21 A. On SCRs?

22 Q. -- SCRs and SNCRs.

23 A. No, I don't agree with that. I'd have to see the
24 context of that.

25 Q. Mr. Kilgore, if you go back to that same page, 79,

1 does it not contain the statement:

2 "These figures include expenditures in 2007 of
3 7 million to continue to reduce NOx emissions through the
4 installation of selective catalytic reduction and
5 selective non-catalytic reduction systems."

6 Page 79 of Exhibit --

7 **A.** You said in 2007. I didn't understand that to be
8 your question. I understood the total amount to be your
9 question.

10 **Q.** Total amount -- does this text not indicate that in
11 2007 the expenditures from TVA for SNCRs and SCRs totaled
12 only \$7 million?

13 **A.** That appears to be what it says for 2007.

14 I think, again, to put that in context, we'd need to
15 go back and look and see what has been spent year -- I
16 mean, projects to date.

17 **MR. BERNSTEIN:** Your Honor, we'd move to admit
18 Plaintiff's Exhibit 497, and as a housekeeping matter, I
19 believe I failed to move to admit No. 530 previously when
20 Mr. Bridgers was testifying.

21 **THE COURT:** 497 and 530?

22 **MR. BERNSTEIN:** No further questions, Your
23 Honor.

24 **MS. COOPER:** Your Honor, we have an objection to
25 497 in that it is merely selected pages from TVA's 10-K

1 and not the entire document.

2 **MR. BERNSTEIN:** Your Honor, it is TVA's 10-K,
3 and my guess is that they have reviewed this document and
4 know very well what's in it.

5 **MS. COOPER:** We know what's in it, Your Honor,
6 but we'd like the whole document in the record.

7 **MR. BERNSTEIN:** Your Honor, we have no objection
8 if the defendants want to offer the entire document into
9 the record.

10 **THE COURT:** Yes. All right. Plaintiff's
11 Exhibit 497 is admitted in its entirety.

12 (Plaintiff's Exhibit 497 received in evidence.)

13 MS. COOPER: Thank you, Your Honor.

14 | THE COURT: Any further questions?

15 MS. COOPER: Yes, Your Honor.

16 THE COURT: All right.

REDIRECT EXAMINATION

18 BY MS. COOPER:

19 Q. Mr. Kilgore, does TVA intend -- is TVA committed to
20 continuing with its step-by-step program to reduce air
21 pollution despite the vacatur of CAIR?

22 A. We do. As I've stated before, it makes good common
23 sense to take the money we've spent, billions of dollars
24 by now, and still spending about a billion-three in east
25 Tennessee, to finish that and operate it.

1 As I said before, it makes good sense because we
2 don't expect the regulations to be less. It makes common
3 sense because we've spent the number and we needed to
4 operate those facilities. And even if we weren't that
5 way, our regulators in our state would not let us just
6 back up from our commitments.

7 **MS. COOPER:** No further questions, Your Honor.

8 **THE COURT:** Further questions, Mr. Bernstein?

9 **MR. BERNSTEIN:** No further questions, Your
10 Honor.

11 **THE COURT:** That will that complete your
12 testimony. Thank you very much. And you may be excused.

13 All right. Call your next witness.

14 **MR. LANCASTER:** Your Honor will be pleased to
15 hear the defense rests.

16 **THE COURT:** Will there be evidence for the --
17 rebuttal evidence for the state?

18 **MR. GULICK:** We have no rebuttal witnesses, Your
19 Honor.

20 **THE COURT:** All right. I will review those
21 tendered exhibits, Defendant's 462, 463, 464, 465, and 530
22 to 537. I will admit those subject to review by the
23 Court, taking into consideration the objections which
24 appear of record, and we'll rule on those and consider the
25 portions only that survive the objections.

1 That way, you won't have to wait for a ruling
2 and I can review it as I'm reviewing all this other
3 evidence in the case. Since no jury is involved, that
4 should not present a problem.

5 **(Defendant's Exhibits 462-465 and 530-537**
6 **received in evidence.)**

7 All right. We had discussed attorneys
8 addressing the Court for up to an hour. Do you all want
9 to do that, or do you want to forego it, or do you want to
10 schedule it for in the morning?

11 **MR. GULICK:** Our preference -- I'm not sure that
12 we'll take an hour, but our preference would be to start
13 in the morning and have both arguments at the same time,
14 unless Your Honor wants to go late, a bit later into this
15 evening. I note that it's about 5:25 now.

16 **MR. LANCASTER:** Your Honor, just to make clear,
17 we do have about a 30-minute closing statement prepared
18 that we're prepared present now or at the Court's
19 pleasure.

20 **THE COURT:** Let's schedule them both then for in
21 the morning at 9 o'clock, not to exceed an hour in
22 duration.

23 And I believe each of you indicated a desire to
24 submit proposed findings of fact and conclusions of law as
25 to judgment in the case.

KAREN H. MILLER, RMR-CRR (828) 771-7217

1 When do you propose to do that? How long will
2 it take you to put that together?

3 **MR. LANCASTER:** We would propose 60 days, Your
4 Honor. We have another trial coming up September 2nd that
5 we leave straight from here and begin that.

6 But we're at the Court's pleasure. That's our
7 suggestion.

8 **MR. GULICK:** Our proposal, Your Honor, was going
9 to be the 11th of August, which would give approximately a
10 week following the time we would anticipate that the
11 record would be -- the transcript would be completed.
12 That would be Monday -- a week from this coming Monday.

13 Your Honor, I would point out we do have a daily
14 transcript, so a good bit of the transcript has been
15 prepared already.

16 **THE COURT:** Let's say prepare what you wish to
17 submit by August the 1st and that will give you -- not
18 August the 1st. September the 1st. Let's see.

19 Let's say September 15, and that will give you a
20 month and a half.

21 **MR. LANCASTER:** Thank you, Your Honor.

22 **MR. GULICK:** Thank you, Your Honor.

23 **THE COURT:** And if you get it through earlier,
24 don't hesitate to let me have it.

25 All right, then, Marshal, take a recess until

1 tomorrow morning at 9 o'clock.

2 (Evening recess.)

3 [END OF VOLUME 11]

4

5
6 UNITED STATES DISTRICT COURT

7 WESTERN DISTRICT OF NORTH CAROLINA

8 CERTIFICATE OF REPORTER

9

10 I certify that the foregoing transcript is a
11 true and correct transcript from the record of proceedings
12 in the above-entitled matter.

13 Dated this 1st day of August, 2008.

14

15 S/ *Karen H. Miller*
16 Official Court Reporter

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